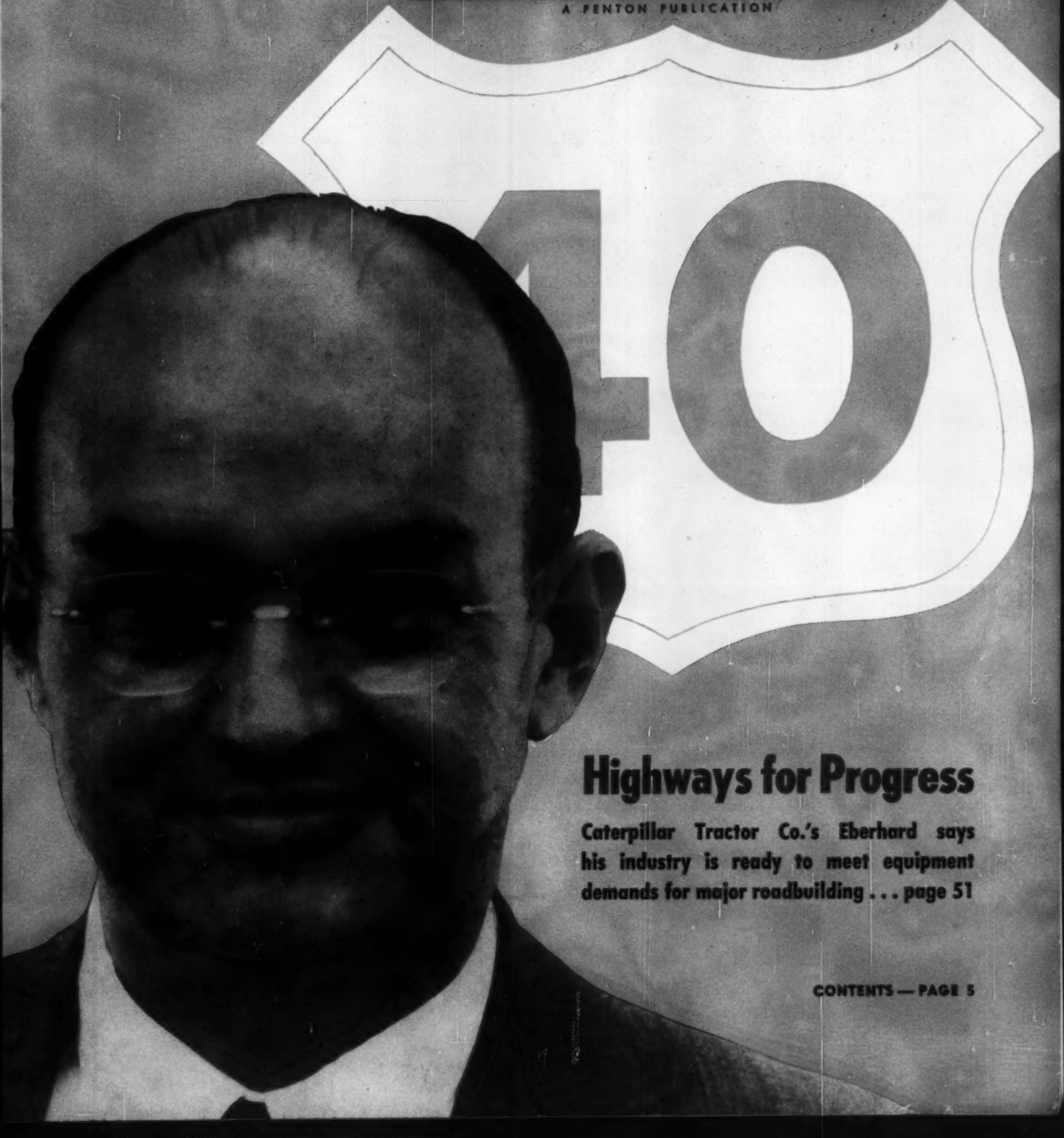
APRIL 16, 1956

STEEL
The Metalworking Weekly

A PENTON PUBLICATION



Highways for Progress

Caterpillar Tractor Co.'s Eberhard says his industry is ready to meet equipment demands for major roadbuilding . . . page 51

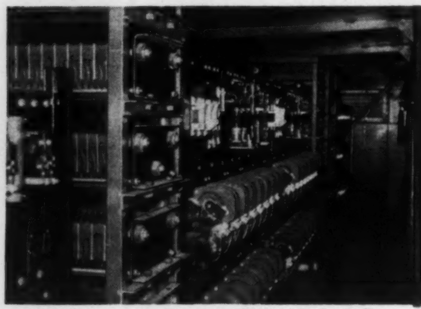
CONTENTS — PAGE 5

Now...
It can
be done
SAFELY
with A-c

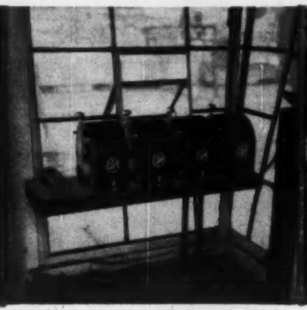
® Registered Trade Mark—U.S. Patent Office

Gantry crane serving fabricating division of large steel company.

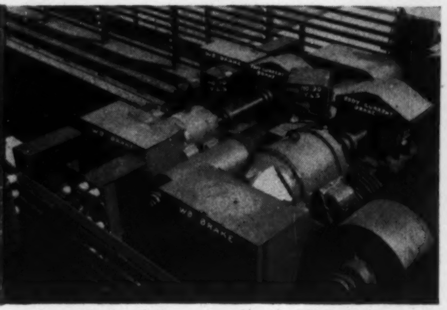
The EC&M ®"EDDYMAG" A-c Hoist Control makes operation SAFE and gives performance comparable to D-c



EC&M Frequency Relay & EDDYMAG Controllers & TAB WELD Resistors combine to insure trouble-free operation.



EC&M Cam Master Switches are easy operating and have short throw.



Crane Trolley fully equipped with EC&M Brakes and Hoist Limit Stops.

There couldn't be any delay! Heavy structural sections must be loaded into cars for shipment to the construction site . . . on a rigid schedule to insure erection within contract-time.

Plant management and company engineers knew the conditions under which this crane was to operate. The installation is remotely located from main-plant power, and situated apart from the routine attention of a regular maintenance crew . . . the crane must be operable in the standard manner, each control point giving *safe, stable speeds.*

Here are the reasons why this A-c Crane is completely EC&M equipped: EC&M is recognized as a leader in Crane Control. EC&M Apparatus has earned a reputation for dependability. Study shows that EC&M A-c circuits and engineering provide maximum safety with simplicity. When control problems arise, make it a point to consult with EC&M.

It pays to "Specify EC&M Control"

4660

EC&M

THE ELECTRIC CONTROLLER & MFG. CO.
Division of Square D Company
4498 Lee Road • Cleveland 28, Ohio

Welding Sealer Skirt on 8000-Gal Storage Tank

In this photograph, taken in the welding shop of the Pfaudler Co., Rochester, N. Y., a sealer skirt is being welded on a vertical-type pressure storage tank for the chemical industry. The tank has a capacity of 8,000 gal, is 160 in. long, and 108 in. in diameter. It was fabricated from ⅝-in. plate. It will be completely insulated and jacketed, and will also be glassed inside.

In fabricating a vessel of this kind, or any other type of welded tank, sound welds are essential to good performance. With Bethlehem plates, sound welds are assured, assuming of course that good welding techniques are employed. This is because the plates are well made, and of uniform quality.

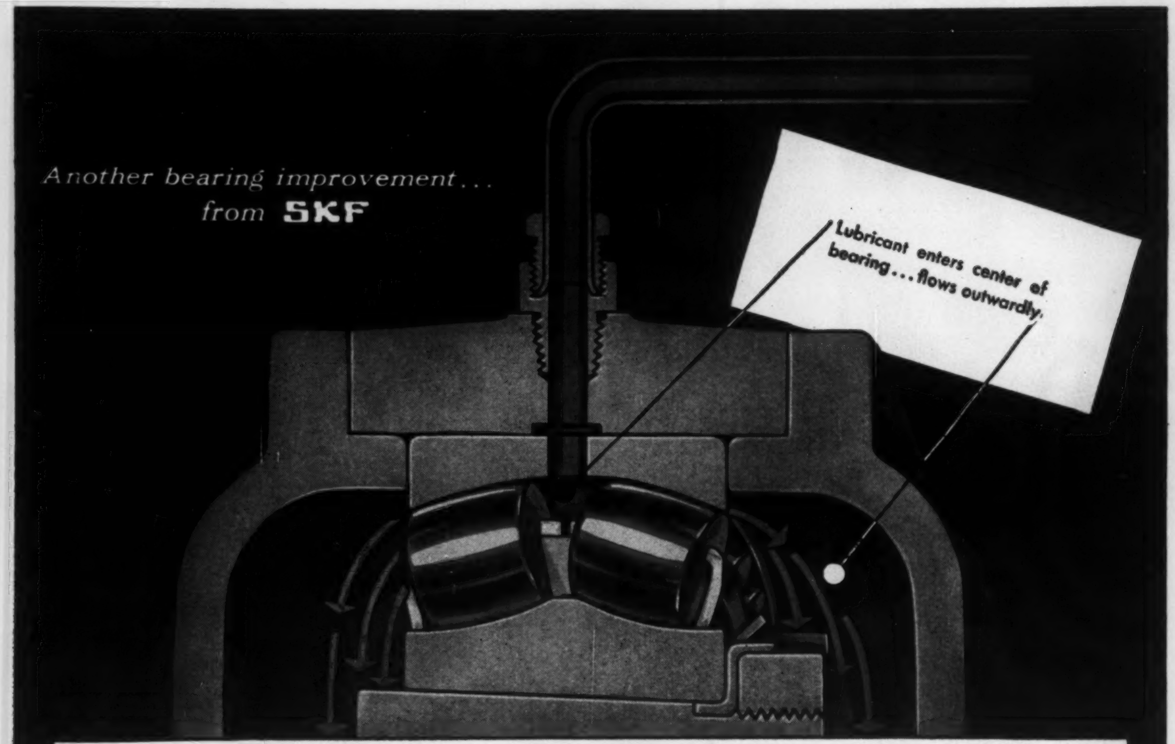
Bethlehem plates are produced for fabricators and other users in a complete range of sheared and universal-mill sizes. If you would like to have complete information, please get in touch with our nearest sales office, or write direct to us at Bethlehem, Pa.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by
Bethlehem Pacific Coast Steel Corporation
Export Distributor: Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



Another bearing improvement...
from **SKF**

NOW AT NO EXTRA CHARGE–

SKF's improved method of lubricating large spherical roller bearings

To make the lubricant effective it should be located where needed–in the bearing. Also, new lubricant, when added, should enter where it does the most good–in the bearing.

For these reasons, all future production of SKF double row spherical roller bearings above 240 mm O.D. (9.4488") will be made with three equally spaced drilled holes in the center of the outer ring without any extra charge to our customers. *This permits the lubricant to enter the center of the bearing.*

With the lubricant (either grease or oil) being introduced into the center of the bearing, all working surfaces are quickly and completely covered. In addition, the outward flow flushes out the old lubricant, and with it, any abrasive dust, dirt, moisture or other impurities.

And where circulating oil lubrication is required, there is a continuous flushing and cooling of the bearing.

This is another example of how SKF helps you to obtain longer bearing life.

7700

Consult your SKF District Office today for complete information so that you can be the first to incorporate into your products this improved method of lubricating large spherical roller bearings.

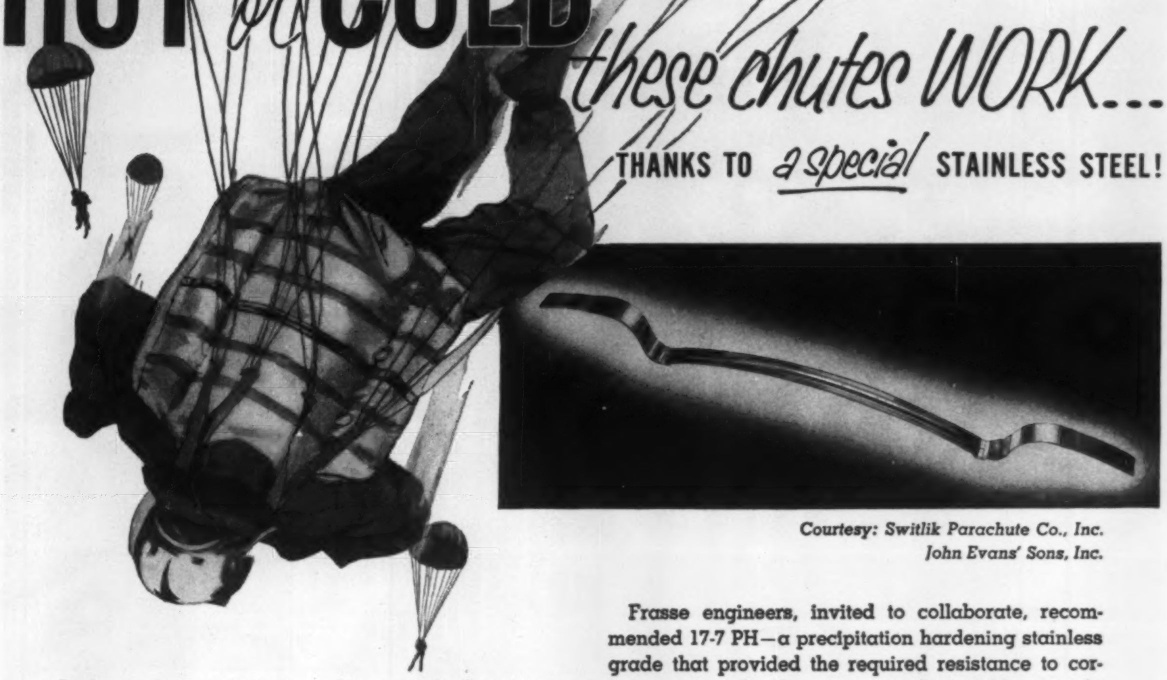
SKF®

BALL AND ROLLER BEARINGS

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.
–manufacturers of SKF and HESS-BRIGHT® bearings.

HOT or COLD these chutes WORK...

THANKS TO a special STAINLESS STEEL!



Courtesy: Switlik Parachute Co., Inc.
John Evans' Sons, Inc.

In the sweltering tropics or sub-zero north, these new Navy parachutes give fool-proof service . . . thanks to the properties of a newly developed stainless steel.

Lighter and far more compact than conventional models—these chutes depend on springs channeled in the fabric—to exert tension when the chute is packed, then provide split-second opening when the rip cord is pulled. Initial designs called for springs of carbon steel until problems of corrosion, and embrittlement from sub-zero temperatures revealed the need for a more suitable steel.

Frasse engineers, invited to collaborate, recommended 17-7 PH—a precipitation hardening stainless grade that provided the required resistance to corrosion and embrittlement . . . made possible a single low temperature heat treatment with practically no distortion. Net result—a problem solved, a more durable, safer product, and 20% reduction in fabricating cost.

New steels and new uses for established grades are the continuing study of Frasse engineers. Consult them on your next steel problem—chances are they can recommend a steel to save money, increase production or improve your product. There's no obligation. Just call or write your nearest Frasse office.

Call FRASSE 1st for STAINLESS STEEL

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Strip
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Sheets
Tubing
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Peter A. Frasse & Co., Inc.
(use address nearest you)

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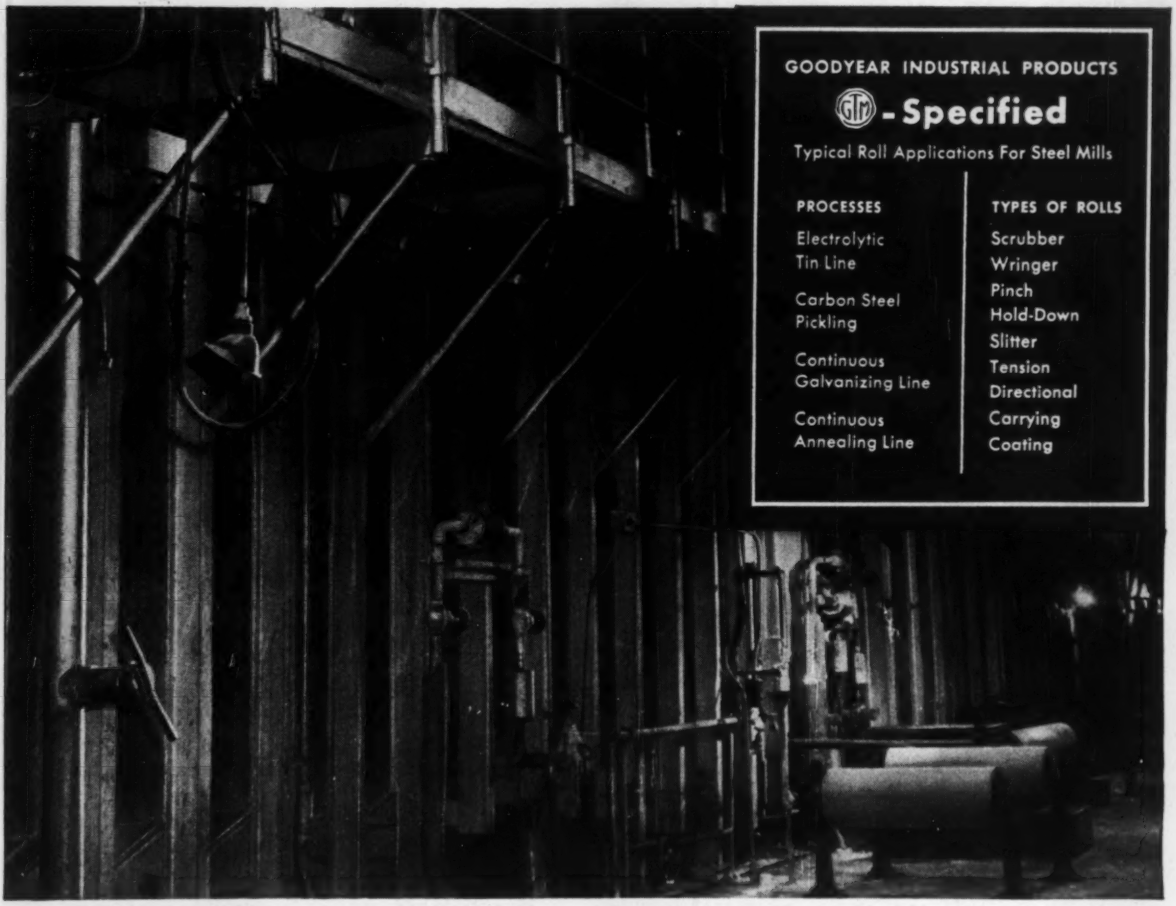
Firm______________________________

Address___________________________

8J



GOODYEAR INDUSTRIAL PRODUCTS

G.T.M. - Specified

Typical Roll Applications For Steel Mills

PROCESSES	TYPES OF ROLLS
Electrolytic Tin Line	Scrubber Wringer
Carbon Steel Pickling	Pinch Hold-Down Slitter
Continuous Galvanizing Line	Tension Directional
Continuous Annealing Line	Carrying Coating

G.T.M. More than doubles life of tin line rolls

ABOUT 18 MONTHS was considered excellent service for the rubber covered rolls in the plating compartments of this tin line. Abrasion and cutting plus constant immersion in approximately 200° F. sodium stannate solution were the life-limiting factors.

Then rolls specified by the G.T.M.—Goodyear Technical Man—were put to the test. They served an average of 3 years and 7 months—were worn down only 1/16" in turning out 4,000,000 base boxes or 71,000 miles of tin plate. And with regrinding they'll be ready for many miles more!

The G.T.M. may well have a similar answer to your rubber covered roll or other industrial rubber problems. Why not find out by contacting him through your Goodyear Distributor? Or write Goodyear, Industrial Products Division, Akron 16, Ohio.

RUBBER COVERED ROLLS by

GOODYEAR

THE GREATEST NAME IN RUBBER

IT'S SMART TO DO BUSINESS *with your Goodyear Distributor. He can give you fast, dependable service on Hose, V-Belts, Flat Belts and many other industrial rubber and nonrubber supplies. Look for him in the Yellow Pages under "Rubber Goods" or "Rubber Products."*

STEEL
The Metalworking Weekly

APRIL 16, 1956
Vol. 138 No. 16

☑ **METALWORKING OUTLOOK, 45**

The Editor's Views, 49

Highways for Progress, 51
Roads mean big business for at least two decades

Management at Work, 61
Servel's John Morrill: Corporate Doctor

Refractory Makers Meet Steel's Expansion Needs, 54

Railroads Go Lightweight, 55

In Canada, the Boomiest Boom, 56

New Stainless Steel Process Developed, 56

Small Business: Big Risk, 57

Presses Show Progress, 63

Windows of Washington, 58

Mirrors of Motordom, 65

The Business Trend, 69

Men of Industry, 73

New Products, 115

Behind the Scenes, 6

Letters to the Editors, 10

Calendar of Meetings, 25

Progress in Steelmaking, 100

Machine Topics, 103

New Literature, 124

☑ **TECHNICAL OUTLOOK, 91**

What Specifications Mean to You, 92
Why you must understand them and conform

New Roles for Powdered Metals, 96
They're expanding in nuclear, aluminum, electronic fields

Radioactive Thickness Gage, 98
It holds rolled computer tape to 0.0001-in. tolerances

Choose the Right Brazing Method, 106
Two big variables are the heating method and filler metal

☑ **MARKET OUTLOOK, 127**

Steel Operations, 127

Price Comparisons, 128

Nonferrous Roundup, 130

Nonferrous Prices, 132

Steel Prices, begin 134

Scrap Prices, 152

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TOLERANCES ARE TOLERANCES . . . or are they?

L. A. Edwards

ASST. SALES MGR., THE CINCINNATI GEAR CO.

Our customers' gear specifications call for many different and often critical tolerances . . . say .0002" or .0003" or whatever they may feel is required for their product. Unless asked, we don't question a customer's specifications, but in some cases we've wondered why particularly close tolerances were called for — and if they were worth the *added cost*. We had an occasion to talk to one customer recently about some gears they had us make to .0002" pin size limit. This firm also made some of its own gears. We asked this man if they had any trouble adhering to such strict tolerances and he said yes they did, but if their parts were "close enough" they used them anyway!

Now, this hardly seems logical — for if his own gears, made to slightly more liberal tolerances, were satisfactory for the job, he could have saved his company some money by being more realistic in his tolerance demands of us. We're not just trying to be philanthropic; it's a purely practical matter for us: unnecessarily critical requirements force us to enter a higher bid and so make our work more expensive than need be. Thus he paid more than necessary for the gears to do his job, and we ran the risk of losing a good customer. That's why we're always happy to see a customer go over his specifications with a sharp pencil.

THE CINCINNATI GEAR CO.
CINCINNATI 27, OHIO
"Gears — Good Gears Only"

CINTI

A Guide to
TOOL STEELS
& CARBIDES
STEEL

HERE'S HELP for your tooling problems

Looking for a tool steel to do a specific job? Want to know where to buy a finishing carbide? This guide has the answers. It is a single source of information on more than a thousand different tooling materials. Knowing the job to be done, you can determine, with the guide, what product to buy and where to buy it. Cross indexes make it easy to locate tool steels and carbides by tradename, or to compile a list of sources for a single type.

JUST PUBLISHED
40 PAGES

Copies of the Guide to Tool Steels & Carbides are available from Editorial Service, STEEL, Penton Bldg., Cleveland 13, O., at the following prices:

1 to 10	$2.00 ea.
11 to 50	1.90 ea.
51 to 100	1.80 ea.
101 to 200	1.70 ea.
over 200	1.60 ea.

behind the scenes

Editors in Voice

Editor Walt Campbell and Associate Managing Editors Vance Bell and John Morgan have been observed lately smoothing down their collective cowlicks (in Vance's case a notable feat), absently adjusting their cravats and waving their arms at office walls. But the light dawned when our ninth floor plant tipped us that these gentlemen had been tapped for talks.

We set out to stalk Campbell, but he had escaped to Canada before we could close in for an interview.

"He's up there in Ottawa attending a Society of Business Magazine Editors meeting," the plant explained. "I don't know how he can keep his mind on business, because he does all his fishing in Canada and every time he hears somebody saying 'oat' for 'out,' he automatically reaches for bait."

"What's he supposed to be doing, aside from making big powwow with his peers?"

"Gathering information for another article on Canadian industry and expansion. Things are moving fast in the mighty dominion, and Campbell figured he'd better bring his report up to date. It appears this week in STEEL."

Morgan rehearsed *his* speech all the way up to Appleton, Wis., where he addressed the Fox Valley Chapter of the Society for the Advancement of Management. His subject was "Supplemental Unemployment Benefits," and we honestly believe nobody knows more about that subject than John Morgan. "Every time I give the talk," he says, "I learn something new from the questions thrown at me."

Vance Bell travels to St. Louis, where he will address the Annual Educational Forum of the Purchasing Agents Association of St. Louis at St. Louis University during the afternoon of Apr. 24 on a topic dear to all hearts: "Looking Ahead at Business." On that same evening Vance will be on television (station KETC), continuing the discussion.

Top Secret Tube

Remember that OFHC copper tubing we mentioned here Mar. 19? It was a composite of a round tube drawn over two half-round tubes, having a mechanical bond. It was made by the Superior Tube Co., Norristown, Pa., for a research laboratory doing Navy work, and even the Superior people didn't know what it was used for. Naturally, it drove them crazy. Finally, to save the remaining sanity of everyone concerned, W. O. Nussear Jr., sales promotion manager at Superior, asked the laboratory wizards for a hint.

"We are engaged in classified research," replied the spokesman for the wizards. "We can't say anything, except that water will flow two ways in the copper tube, and it's part of a gimmick to control the hydrogen bomb reaction. The tubes are satisfactory; just keep 'em coming, and don't be so nosey."

"It isn't that we're nosey," Nussear complained. "It's just that we can produce this same tube in carbon, alloy and stainless steel, and maybe 50 other alloys, but nobody ever asks us. And if we ask any more questions about what's being done with our copper tubes, we might get arrested!"

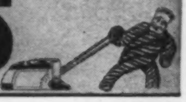
Chairs, Stools, Uncles

Martha N. Stratton, research assistant, Ohio State University, brightens our page simply by appearing in it. She rattled off the correct answers to the studio furnishing puzzle in no time, and said it might have been easier if we had mentioned the color scheme. (Answer by the way, was ten chairs and two stools in one studio, and five chairs and six stools in the other.) Try this one, Martha: It was sent in by a gentleman who signs himself: "The worst metallurgist east of the Mississippi." He writes: "On my second, third and seventh birthdays I was one-fifth, one-third and one-half as old as my uncle was on those days. On what day of the week was I born?"

Shrdlu

(Metalworking Outlook—Page 45)

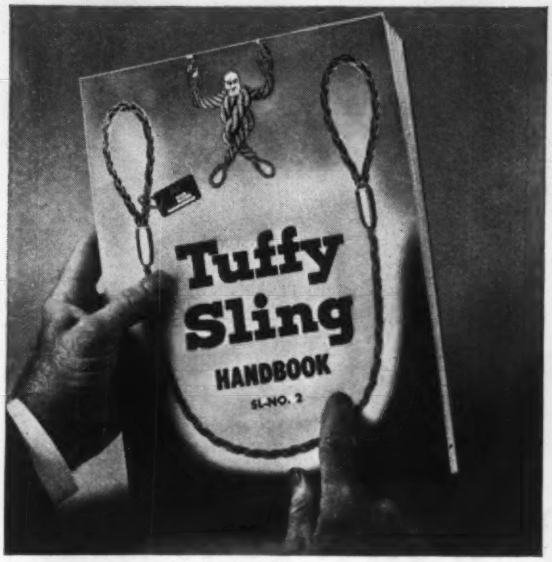
Tuffy® SLING NEWS



Vol. 1 Published Monthly in Leading American Trade Magazines by Union Wire Rope Corp. **No. 3**

NEW FERRULE EYE SPLICE FEATURED

In Big, New Tuffy Sling Handbook Just Off Press-FREE



First editions of this handbook were so popular that 85,000 copies circulated to sling users. If you use or buy slings—if you're a plant engineer, safety engineer or purchasing agent—you'll find this new, enlarged edition of the Tuffy Sling Handbook the most comprehensive ever published.

It tells you all about the new factory-fitted slings added to the Tuffy line. It shows why the new Tuffy pressed-on ferrule makes Tuffy slings faster, safer, and easier to load and unload than ever before. Many of the fittings—clamps, hooks, bridles, thimbles, saddles—are new, too. And this latest edition of the Tuffy Sling Handbook contains a host of other useful information: a complete rigger's manual, proof tested ratings and specifications for all Tuffy Slings; a new engineer's notebook; data tables on a full line of versatile, easy-to-apply sling fittings.

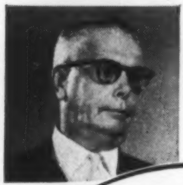
But don't delay to order your *FREE* copy. Mail the coupon to us now. We'll send it to you by return mail with Tuffy's compliments—nothing to buy, no obligation. Hurry. The supply is limited!

New Tuffy® Ferrule Makes Sling History

It's on all Tuffy Slings, but it doesn't cost you a penny extra. There's no sling ferrule like it anywhere. Tuffy's streamlined metal ferrule is set on the eye splice under pressure so great that the inner metal virtually flows into the voids between the wire fabric. A force of friction is created so great that the eye splice has strength equal to that of the famous machine braided Tuffy wire fabric. It makes Tuffy Slings stronger. It makes them safer: The ends of the tapered ferrule are swaged tightly to the fabric leaving no edges to hang up on loads or to injure workers' hands in hitching to and unhitching from sling loads. There's still another advantage—because Tuffy Slings are easier and safer to load, they're also faster to load. Your men can do more work when they're working with Tuffy Slings.

YOU CAN'T HURT A TUFFY SLING

Loop it, pull the loop taut. Tuffy's 9-part machine braided wire fabric construction resists kinking. But if you *are* able to kink it, you can straighten it out quickly and without materially damaging the fabric.

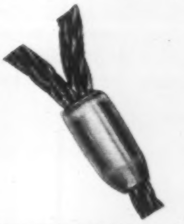


CONSULT YOUR DISTRIBUTOR

when you want to buy Tuffy Slings or Tuffy Hoist Lines. Give him your requirements. He'll stock an inventory for you to draw against. It saves you time and money.

New Tuffy® Ferrule

has no sharp edges to injure hands or catch on loads. The tapered and rounded ends are swaged tight to the sling fabric. The tremendous pressure at which the ferrule is pressed around the machine braided wire fabric flows the metal into the voids of the eye splice and gives the eye splice 100 percent of the strength of the fabric.



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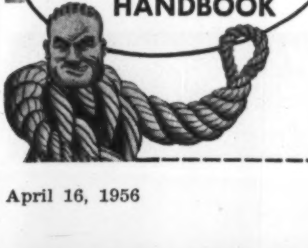
Mail for New FREE
Tuffy Sling
HANDBOOK



union Wire Rope corporation

Specialists in high carbon wire, wire rope, braided wire fabric, stress relieved wire and strand.

2160 Manchester Avenue, Kansas City 26, Missouri

MY NAME____________________ TITLE__________

COMPANY NAME____________________

ADDRESS____________________

CITY____________________ ZONE_____ STATE__________ 14

New Case "400" Tractor, shown here, is setting new standards of tractor capacity, convenience comfort, appearance and over-all performance.

Many parts of YOUNGSTOWN Steel go to make Case's "new from ground up" 400 Tractor

Not often does a farm equipment manufacturer create an entirely new tractor. Such a change is costly—both in time and in tooling costs. But, the J. I. Case Company of Racine, Wisconsin, did it with the Case "400" Tractor.

Another thing that Case did was to make sure that the "400" would be a quality product. That's why parts such as 4th and 8th speed gear seat reinforcement, rear axle shaft, differential shaft, reverse idler gear, front wheel spindle and many others are of Youngstown Steel. These parts utilize 5 different Youngstown Steel products: Hot Rolled Alloy Bars, Hot Rolled Carbon Bars, Hot Rolled Sheets, Cold Rolled Sheets and Standard Black Pipe.

In all Youngstown Steel products, you will find the same dependable uniformity, because Youngstown controls the complete manufacture from start to finish, with emphasis on quality throughout.

Let Youngstown help you with your steel problems. For information and service, get in touch with the local Youngstown distributor—or phone our nearest district sales office.

Youngstown

THE YOUNGSTOWN SHEET AND TUBE COMPANY *Manufacturers of Carbon, Alloy and Yoloy Steel*

General Offices Youngstown, Ohio District Sales Offices in Principal Cities.

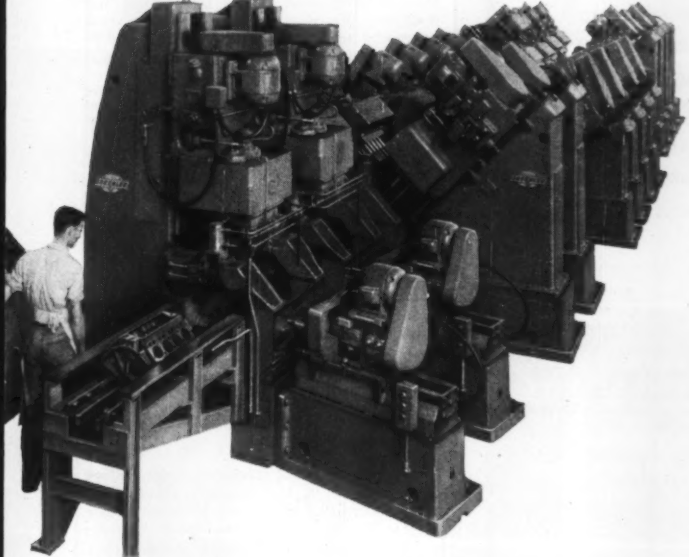
SHEETS - STRIP - PLATES - STANDARD PIPE - LINE PIPE - OIL COUNTRY TUBULAR GOODS - CONDUIT AND EMT - MECHANICAL TUBING - COLD FINISHED BARS - HOT ROLLED BARS - WIRE - HOT ROLLED RODS - COKE TIN PLATE - ELECTROLYTIC TIN PLATE - BLACK PLATE - RAILROAD TRACK SPIKES - MINE ROOF BOLTS

PRODUCTION MACHINERY
GREENLEE
GREENLEE

NOW . . . BIGGER TO SERVE YOU BETTER

New, Enlarged Production Facilities Speed Delivery of Greenlee

TRANSFER MACHINES



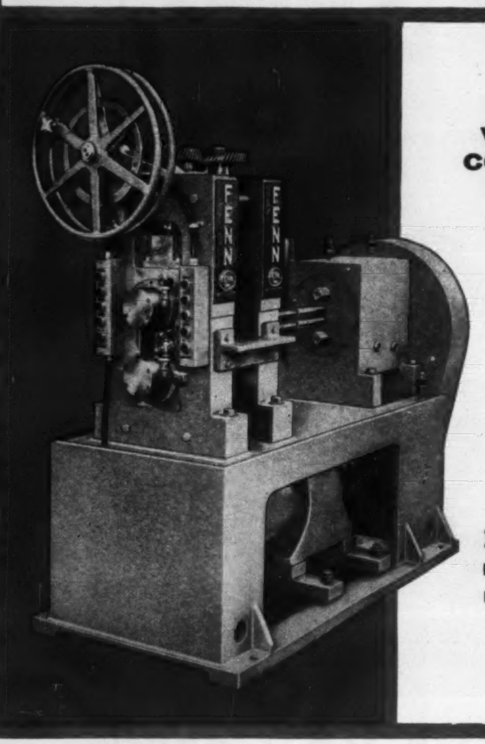
Pictured is one of four Greenlee assembly floors. This newly constructed, block-long building covers almost two acres of ground . . . provides a well-lighted, roomy area for erecting and testing Greenlee Transfer Machines similar to the ones illustrated.

This 17-Station Greenlee Transfer Machine, the first in a line of three . . . carries 152 tools. It automatically drills, countersinks, cleans and gauges holes in V-8 cylinder blocks. Take advantage of Greenlee's specialized assistance in planning for automatic production. Write or wire today for a consultation.

PRODUCTION MACHINERY
GREENLEE

GREENLEE BROS. & CO.
1924 Mason Avenue
Rockford, Illinois

NEW LABORATORY SIZE
ROLLING MILL



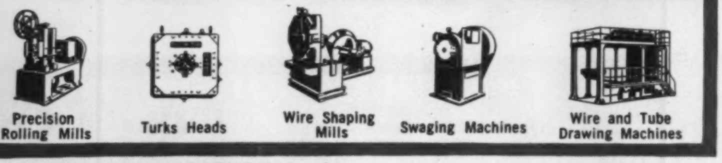
COMBINES
PRECISION
VERSATILITY
COMPACTNESS
MODERATE
COST

EXTRA HEAVY
BEARINGS PERMIT
ROLLING NEWEST
AND TOUGHEST
METALS

MODEL 4-053 is the newest and finest Precision Rolling Mill engineered especially for metallurgical and research laboratories in industry and colleges . . . or for a production mill in many applications. Extremely flexible it can be used as (1) a two-high, (2) a four-high with work rolls driven, and, (3) a four-high with back-up rolls driven. This unique three-way drive, and a full line of accessories, permit a complete range of reductions in both hot and cold rolling. Write for complete specifications or copy of our rolling mill catalog.

FENN

FENN
ENGINEERING SERVICE
is available at all times to help you solve rolling problems. Fenn engineers will also gladly test-roll samples of your materials.



Precision Rolling Mills
Turks Heads
Wire Shaping Mills
Swaging Machines
Wire and Tube Drawing Machines

THE FENN MANUFACTURING CO., 401 FENN ROAD, NEWINGTON, CONNECTICUT

LETTERS
TO THE EDITORS

Californian Wants Sheets

In the Market Outlook column of the Mar. 26 issue (page 177), you refer to New England as a "buyers market." We are in urgent need of 24 and 26 gage, cold-rolled, commercial-quality sheets. Can you tell us where and how we can purchase them?

H. C. Norton
B. W. Norton Mfg. Co.
Oakland, Calif.

• *Although steel production is down in New England, this affects products other than sheets since the area doesn't produce sheets. You might contact the principal sellers of cold-rolled sheets in New England: Bethlehem Steel Co., U. S. Steel Corp. and Alan Wood Steel Co.*

Space Heating

On page 146 in your Mar. 26 issue is an interesting article, "Space Heaters That Shine." The firm producing these heaters is mentioned as Perfection Industries. We would like to contact this company for catalogs and pricing information. May we have the complete address?

Helen L. Markiewicz
Purchasing Department
Improved Machinery Inc.
Nashua, N. H.

• *The address is 7609 Platt Ave., Cleveland, O.*

Avid Reader of STEEL

We would like a reprint of the insert, "A Guide to Tool Steels and Carbides" (Mar. 12, page 127). We are avid readers of your magazine and like it best by far of any publication of its kind.

Stanley C. Fleckner
Standards Engineer
Canning Machinery Division
Food Machinery and Chemical Corp.
San Jose, Calif.

Garbled Facts

We noted the item, "Look Before You Leap," in the Metalworking Outlook column of the Mar. 19 issue (page 37). The writer of the item appears to have received garbled information, and, as a consequence, the inaccuracy of the article could mar STEEL's reputation for factual reporting.

The following are the facts:

1. The engineers at the Westinghouse plant in Mansfield, O., formerly were members of a union comprising nonprofessional and professional employees.

(Please turn to page 12)

FIELD REPORT: NO. 91

WHICH DIE STEEL WOULD YOU USE HERE to increase production from 100 to 23,000 parts?

Even after trying many different die steels, production averaged only about 100 pieces before this ring die had to be replaced.

The die cold forms cups as the first operation in producing rocket projectile noses from SAE 1010 Steel. Even though the ring die is press fitted into a four foot diameter hardened retainer ring (Rc. 34/36), the 1700 tons of pressure exerted in power extrusion prematurely stretches the die. The 12 lb. 2 oz. cups must be held within .2 of a lb. and wall thickness within .010″.

Which die steel would you specify in a move to cut replacement costs and improve production?

From our customer Field Report files, here's how the toolroom solved the problem. The Carpenter Matched Set Method showed that Carpenter VEGA (Air-Tough) Die Steel was a natural for the job. Latest report shows that the VEGA ring die had increased production from 100 to 23,000 cups, and is still banging them out.

What better guarantee of success can you find for your own jobs than the word of hundreds of toolroom men who rely on Carpenter. Why settle for "ordinary" results when Carpenter is ready to help you explore the possibility for improvement? Call your nearest Carpenter Mill-Branch Warehouse, Office or Distributor now.

How can your toolroom use Carpenter Matched Tool and Die Steels to:

Reduce hardening hazards
Minimize machine downtime
Boost output per grind
Improve product quality

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Matched Tool and Die Steels

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Export Address: Port Washington, N. Y. — "CARSTEELCO"

'Load Lifter'
DOUBLE GIRDER
Manning, Maxwell & Moore, Inc.

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THE CRANE YOU WANT FROM A CATALOG

If your plans call for an all-electric crane in 1 to 20-ton capacity, be sure to see our catalog of Series "D" 'Load Lifter' Cranes. These cranes are standardized and mass produced for average industrial needs. They are built in three basic types. There are three styles of trolleys and spans range up to 80 feet. You can have cage or floor control. Whatever type and capacity is required, you can order by number from the catalog. And, you will find prices much lower than those of other cranes for similar service.

Series "D" 'Load Lifter' Cranes have many plus-value features that contribute substantially to long life, complete safety and economical performance. A *three-girder* bridge is provided on cranes with moderate spans to prevent whipping and skewing; box-section welded girders assure extra rigidity in cranes with spans over 50 feet. Variable-speed magnetic control and fast-acting bridge brake make spotting easy. All gearing operates in oil to minimize frictional wear. The bridge and trolley wheel axles rotate smoothly on anti-friction bearings.

Series "D" 'Load Lifter' Cranes have many other design and operational advantages essential to assure dependable service. Write for Catalog 221 and see for yourself why these rugged cranes are outstanding in value and price.

'Load Lifter'® CRANES

MANNING, MAXWELL & MOORE, INC.
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Builders of "Shaw-Box" and 'Load Lifter' Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, 'American' and 'American-Microsen' Industrial Instruments, and Aircraft Products.

LETTERS

(Concluded from page 10)

They were granted an NLRB-supervised election, voted themselves out of that union and won certification as a professional bargaining unit in January, 1956.

2. The engineers at the Westinghouse plant in Jersey City, N. J., have never been members of the AFL-CIO or any other union. They were certified as a professional bargaining unit, composed only of engineers after an NLRB election in June, 1955. This certification was upheld by a unanimous decision of the NLRB.

May we point out that the right of professional employees to seek decertification from a heterogeneous group is protected by the Taft-Hartley Act, Section 9.

William A. Brenneck
President
Westinghouse Engineers Association
Bloomfield, N. J.

Check on Costs

BILL
COSTS
INVOICE
COSTS
COSTS

Please send two copies of the article, "Know Your Costs" (Mar. 12, page 83), No. 2 in your Program for Management, 1956. This is the best article of this nature I have ever read. It should be in the hands of anyone connected with costing or management.

Walker Jamar Jr.
Walker Jamar Co. Inc.
Duluth

We feel that this appropriate and timely article can be of immediate assistance to our operations staff. Please send ten reprints.

Ralph M. Quin
Vice President-Operations
Anthony Co.
Streator, Ill.

Water Is Important Item

Please send one copy each of the articles, "More Work for Water" (Jan. 30, page 84) and "Dollars Down the Drain" (Feb. 6, page 136). These are important items in our plant, and we are impressed with these two articles.

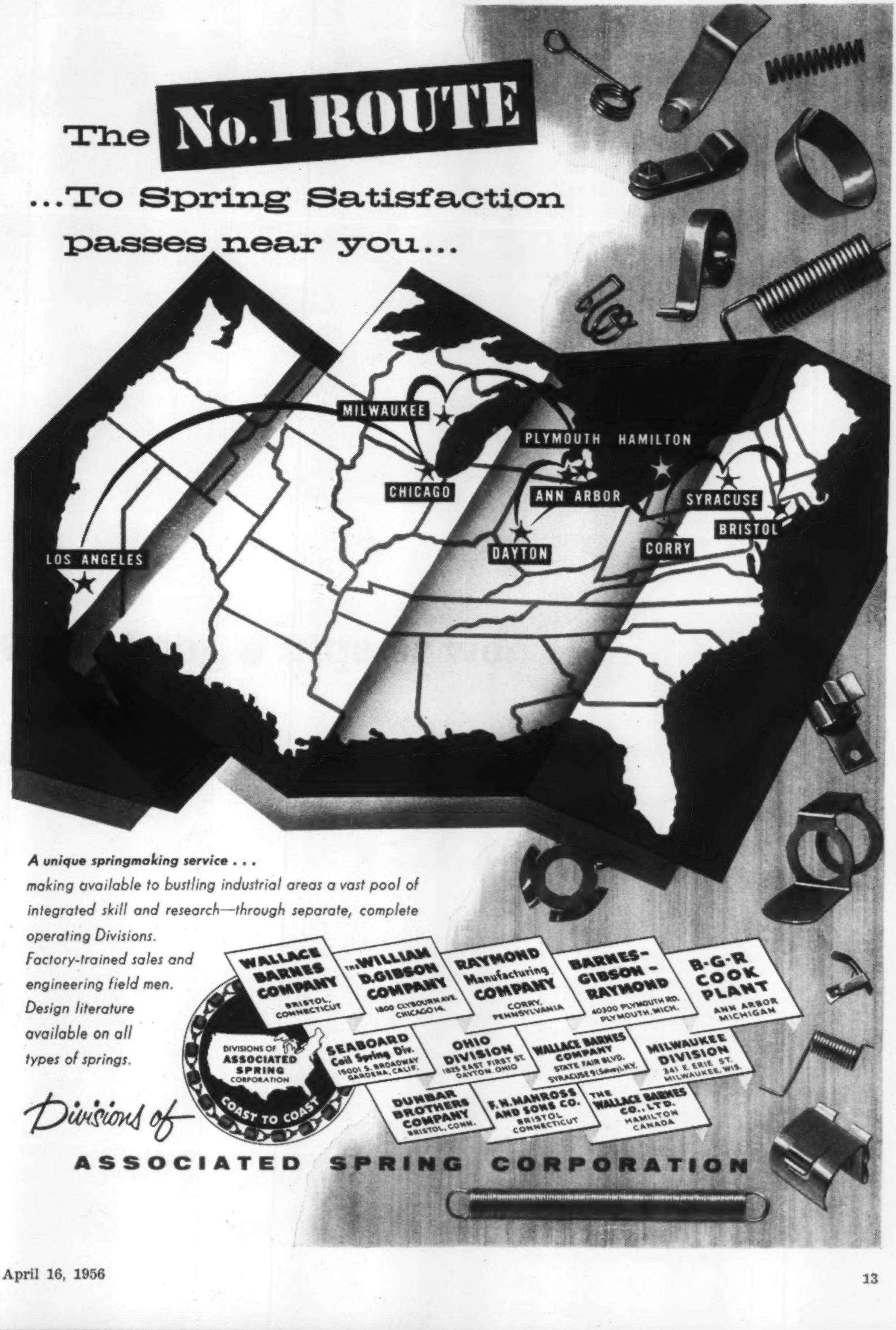
R. R. Savage
Secretary
DuPage Boiler Works Inc.
Naperville, Ill.

List of Soaking Pits

Do you put out a census of soaking pits in the U. S.? I am interested in knowing the number of soaking pits by plant and by company.

J. O. Kamm
President
Cleveland Quarries Co.
Amherst, O.

• *We do not have such a list. We suggest you see the* Directory of Iron and Steel Works of the U. S. and Canada, *issued by the American Iron & Steel Institute, 350 Fifth Ave., New York 1, N. Y. Each steel plant, along with its facilities (including soaking pits) is listed.*



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how to spin a good yarn

The happy ending comes quickly when Avey machines are in the story, as the makers of this textile spindle base discovered. Savings in production time, direct labor, and plant space will probably return their equipment investment in a single, solitary year.

What makes Avey machines such high-yield investments? For one thing, they're generally simple assemblies of basic components on which the engineering has largely been paid for. Costs are lower; the price becomes more favorable; the savings per part, or per hour, pay off the investment sooner.

For another: we take our own medicine. You'll find most of the machines in our shop young, and shiny, and productive.

▶ **production data:** This 6-station Avey indexing machine performed drilling, tapping, milling, and broaching operations. Fixtures arranged to handle two different parts. Milling and broaching done in one pass, with cycle time of 8 seconds. Rate: 380 parts/hr. at 100% efficiency.

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drilling, tapping, production machines

with a happy ending

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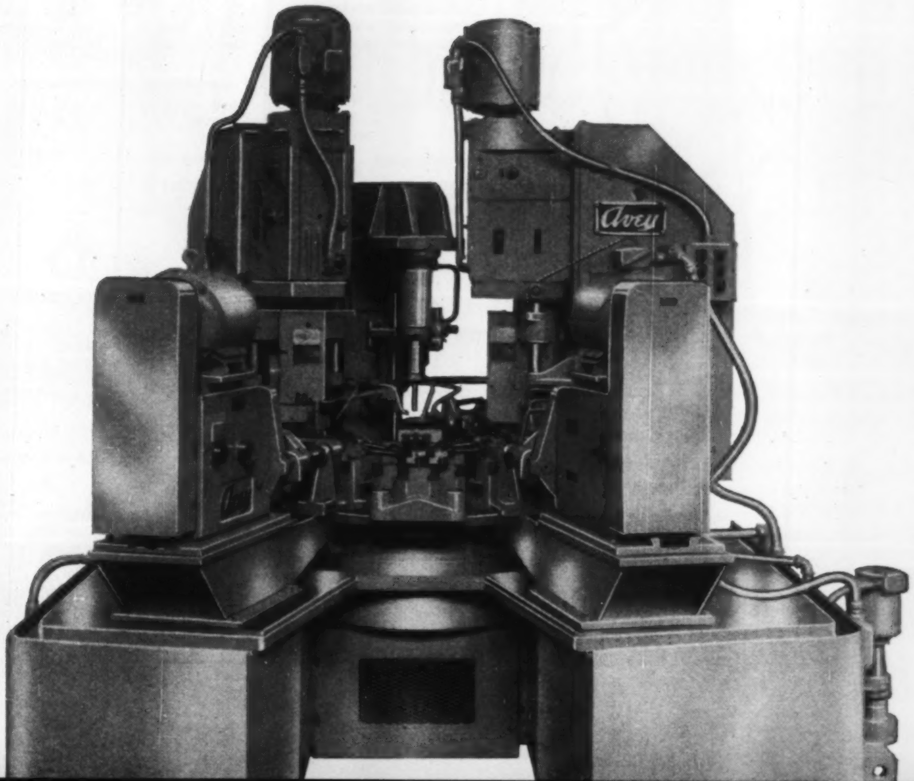
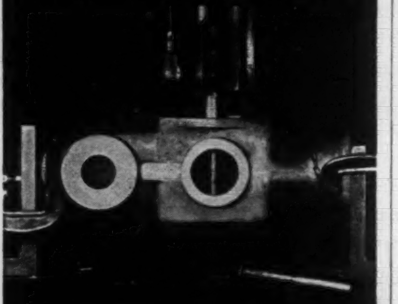


33% DECREASE IN DIE WEAR
ON THIS GRAY IRON FITTING



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FOR FREE BOOKLET on FERROCARBO, citing actual case histories of faster machining, with longer tool life, write The Carborundum Company, Dept. 55, Niagara Falls, N.Y. 84-55

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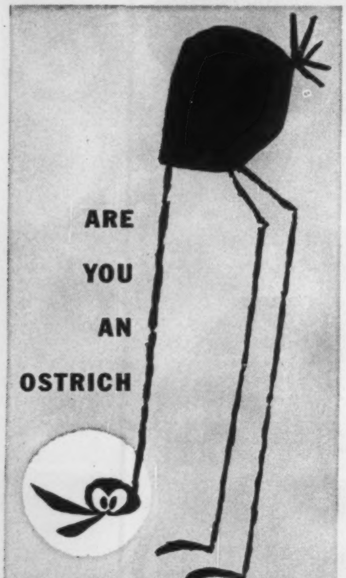

. . . when it comes to cancer?

Do you bury your head in the sand and hope it won't attack you or someone close to you? Fight cancer with a check-up to protect yourself and a check to help others.

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AMERICAN CANCER SOCIETY

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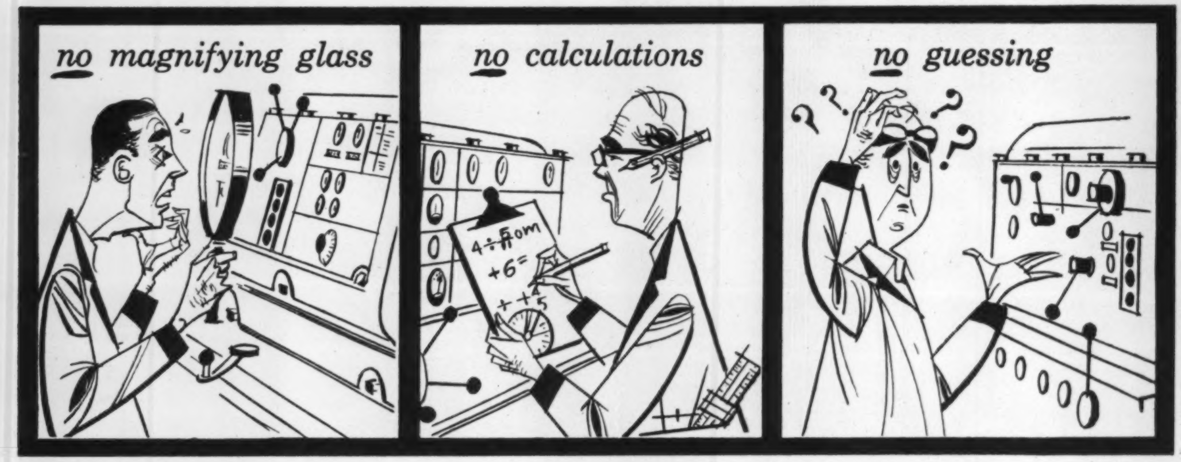

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c . . . set levers to automatic indicator lights

This time-saving, fool-proof simplicity is but one feature of New POWERTURN Lathes. Combined with traditional Lodge & Shipley accuracy and rugged strength are many other features for new precision and new operating convenience.

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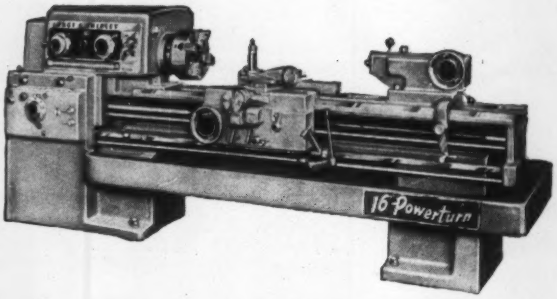

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Pack your bag, jump in your car, board your ship, your train, your plane—join America on the go. And thank brick that you *can* go. Refractory brick that produces the concrete for your highway, the turbines for your ocean liner, the stainless steel for your streamliner, the wings for your plane.

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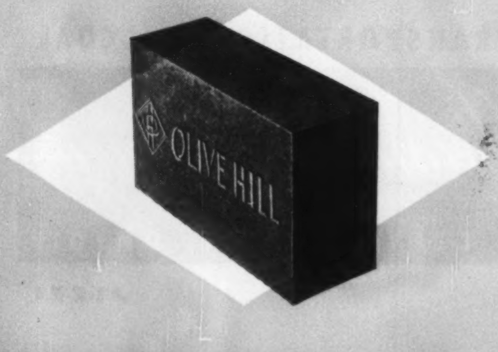
OLIVE HILL BF and OLIVE HILL HI-FIRED brick rank high in any list of prominent and widely used brands of blast furnace refractories. Manufactured from dense-burning Kentucky flint fire clays by Grefco's unique manufacturing processes, OLIVE HILL brick set a standard for blast furnace refractory quality and workmanship.



Grefco processing of OLIVE HILL brick entails:

1. Careful selection, testing, stockpiling and blending of fire clays to insure uniform raw material quality.
2. Grinding and screening to prescribed formula to promote high density of product.
3. Efficient deairing during brick forming, also to promote density and proper physical structure.
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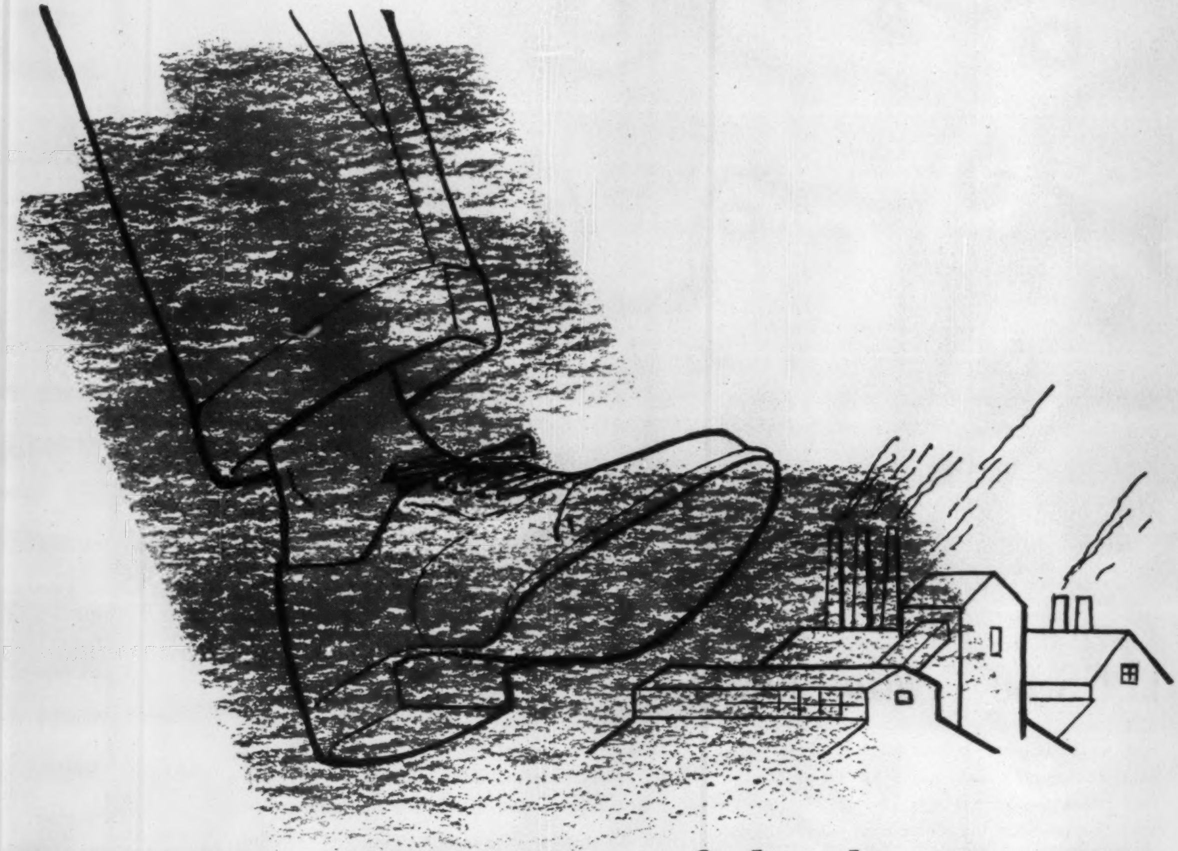
In service, OLIVE HILL blast furnace brick, both BF and HI-FIRED, have produced many splendid performance records in the past. OLIVE HILL linings in presently operating furnaces, are giving outstanding performance and are more than meeting the increasing requirements of the expanding American Iron and Steel Industry.



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is facilitated by the production of high-grade ores, the maintenance of a fine ore vessel transportation fleet, modern mining equipment, and the employment of skilled employees. This "team work" keeps industry and commerce ahead of the times, thus insuring further development on a greater scale than ever before in history.

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GARDNER
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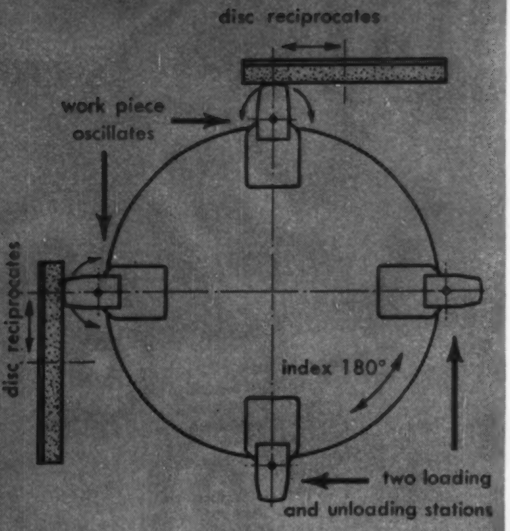
Gardner Disc Grinder Generates Curved Surface on Rough Forgings


disc reciprocates
work piece oscillates
disc reciprocates
index 180°
two loading and unloading stations

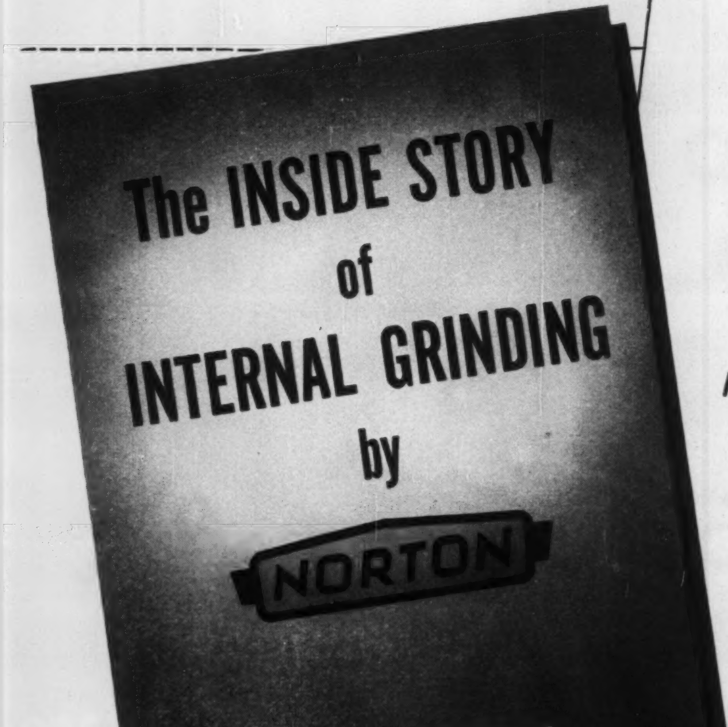
Job Data

MACHINE	Gardner No. 742-42" Grinder.
TOOLING	Hydraulic work table automatically indexes and fixtures oscillate work across discs. Work is hydraulically clamped.
PART	Rock bit heads ranging from 3⅞" to 15" in size; steel forgings.
OPERATION	Grinding radius on heads.
STOCK REMOVAL	Up to 5/16"—in one cycle.
ABRASIVES	Two Gardner 42" Yellow Rim WIRE-LOKT® Discs.

GARDNER

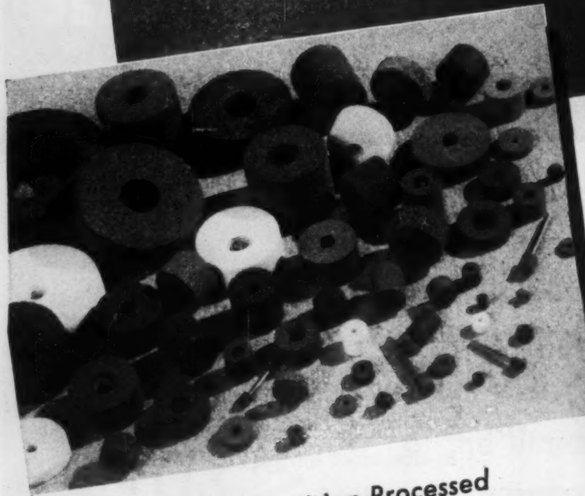
precision disc grinders

BELOIT, WISCONSIN



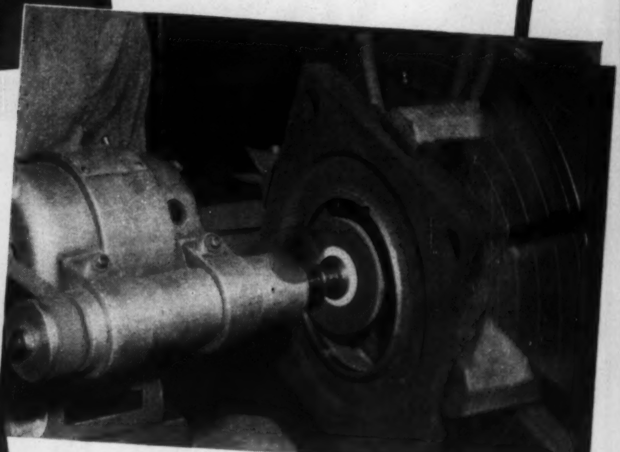
The INSIDE STORY
of
INTERNAL GRINDING
by
NORTON

How Norton wheels for internal grinding step up your product quality and profits with the **"TOUCH of GOLD"**



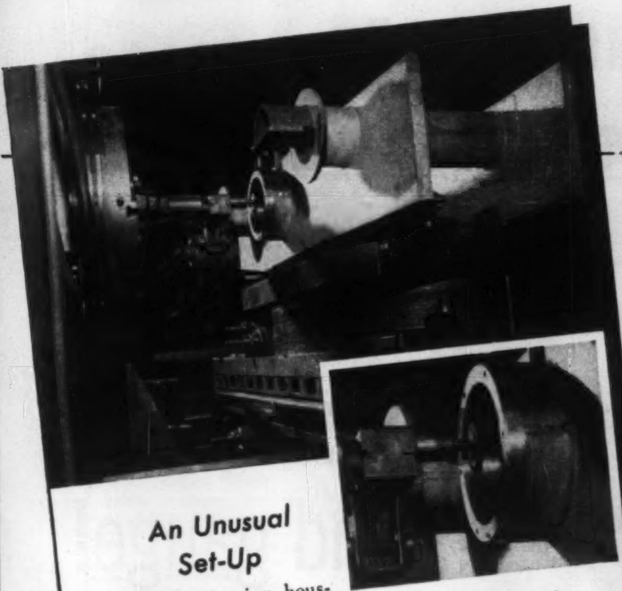
They're Precision-Processed

Norton wheels for internal grinding are built by exclusive precision-processing that results in absolutely uniform grinding action, in wheel after wheel of the same specifications. This means you can depend on each Norton wheel of the same specifications for exactly the same grinding action. No fussing with timing cycles when you change wheels — you save on every grinding job. Other typical "Touch of Gold" advantages include their fast, free, cool-cutting action and extra long life. Norton wheels are made in types, sizes, bonds and abrasives for every internal grinding application.



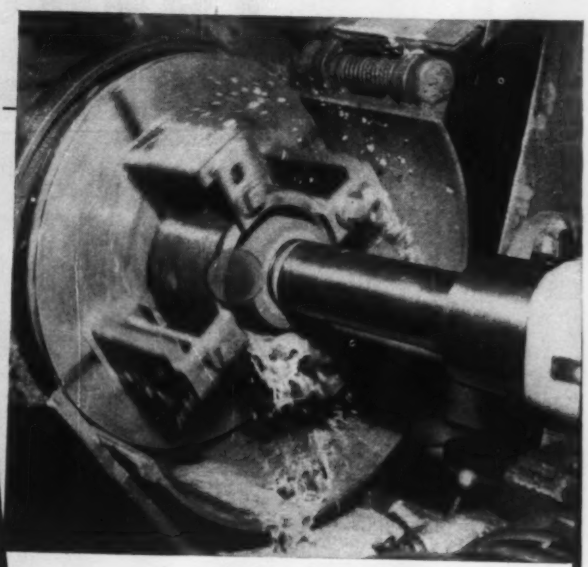
The Famous Norton G Bond

The Norton G Bond is the most efficient vitrified bond ever developed for precision and semi-precision grinding. Holding each abrasive grain just long enough for maximum cutting action, it assures a constant grinding surface of fresh, sharp cutting edges. As a result, G Bond wheels cut cooler and faster . . . produce smoother finishes . . . dress easier and give more pieces per dressing. With Norton 32 ALUNDUM* abrasive — outstanding for heavy feeds and rapid stock removal — it makes an ideal "Touch of Gold" combination for your grinding jobs on steel and steel alloys.



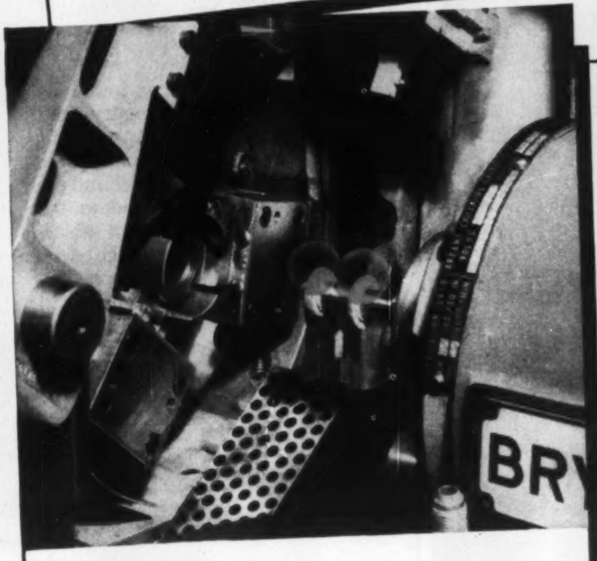
An Unusual Set-Up

Grinding bearing housings with a Norton wheel on a Dumore tool post grinder, mounted on a horizontal boring mill. The grinder itself revolves in a planetary motion, the grinding wheel spindle following the I.D. of the hole. To grind the other end of the housing the work table is turned 180°. *Material:* cast steel. *I.D.:* 7.8737". *Stock removal:* .005" each end. *Limits:* +.0001", −.0004". *Time:* two hours each end



Rounding It Out — Fast

During hardening, a certain amount of warpage occurs in this steel mould band. A Norton wheel is grinding it perfectly round and smooth. The band has an I.D. of 6" and is 4" deep. Average amount of stock removal is .040" and the time cycle is 30 minutes.



Precision Performance — Doubled

Here a Norton two-wheel set-up is ready to go into fast grinding action. The job is grinding a double race in a steering gear bearing. *Material:* SAE 1045 steel, 54 Rockwell C. *I.D.:* 1.1507". *Stock removal:* .012". *Limits:* +.0000", −.0005". *Finish:* 10 microinches RMS.

See Your Norton Distributor

for further facts on how Norton wheels can bring the value-adding, money-saving "Touch of Gold" to your own internal grinding operations. He'll be glad to arrange a test in your plant. Or write direct to your nearest Norton district office. And remember: only Norton offers you such long experience in both grinding wheels and grinding machines. NORTON COMPANY, Worcester 6, Mass. Offices in nine cities. Distributors in all industrial areas — listed under "Grinding Wheels" in your phone directory, yellow pages. Behr-Manning, Troy, N. Y., division of Norton Company. *Export:* Norton Behr-Manning Overseas Incorporated.

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to make your products better

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Grinding Machines • Refractories

BEHR-MANNING PRODUCTS: Coated Abrasives
Sharpening Stones • Pressure-Sensitive Tapes

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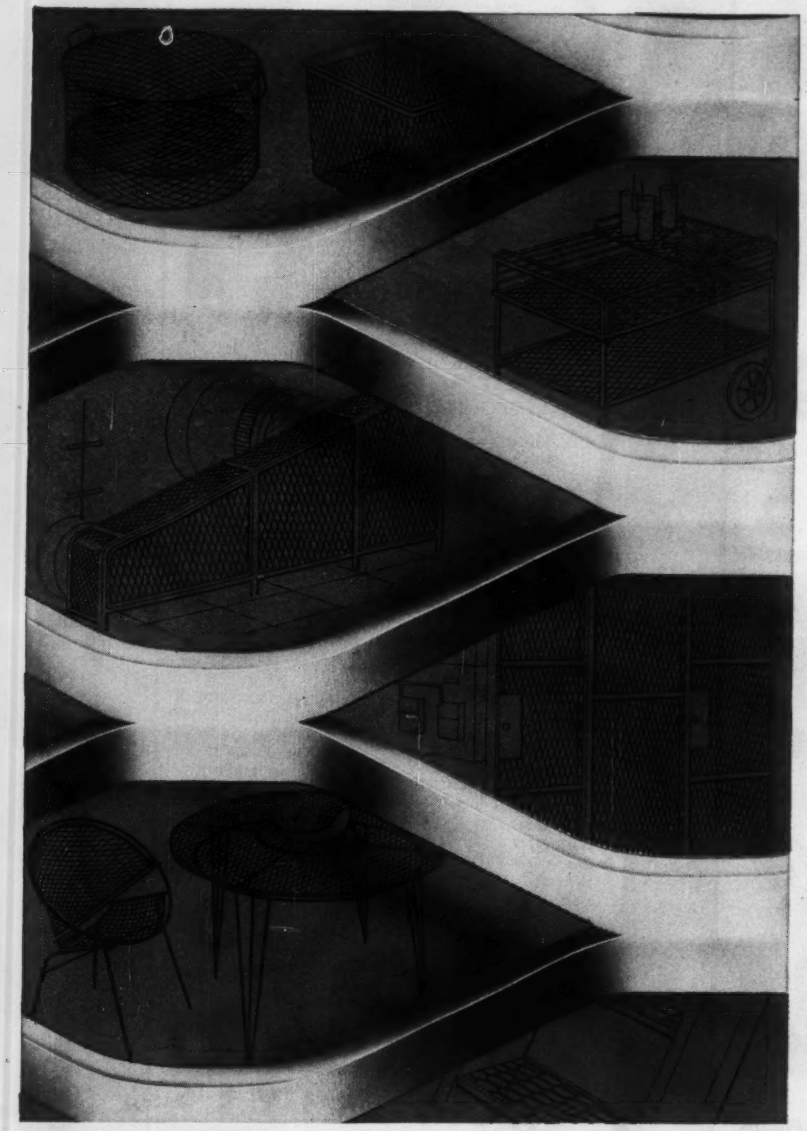

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Apr. 16-17, American Society of Mechanical Engineers: Gas turbine power conference, Hotel Statler, Washington. Society's address: 29 W. 39th St., New York 18, N. Y. Secretary: C. E. Davies.

Apr. 18-19, Bituminous Coal Research Inc.: Annual meeting, Deshler Hilton hotel, Columbus, O. Association's address: 804 Southern Bldg., Washington, D. C. Secretary: C. A. Reed.

Apr. 18-19, Armour Research Foundation of Illinois Institute of Technology: National industrial research conference, Sherman hotel, Chicago. Foundation's address: 10 W. 35th St., Chicago 16, Ill.

Apr. 19-21, Gas Appliance Manufacturers Association: Annual meeting, Greenbrier, White Sulphur Springs, W. Va. Association's address: 60 E. 42nd St., New York 17, N. Y. Secretary: Harold Massey.

Apr. 22-24, National Tool & Die Manufacturers Association: Spring board meeting. Hotel Statler, Washington. Association's address: 907 Public Square Bldg., Cleveland 13, O. Executive secretary: George S. Eaton.

Apr. 22-26, American Ceramic Society: Annual meeting, Hotel Statler, Columbus, O. Society's address: 4055 N. High St., Columbus 14, O. Secretary: Charles S. Pearce.

Apr. 23-25, American Zinc Institute and Lead Industries Associations: Combined annual meeting, Hotel Statler, St. Louis. Information: Robert L. Ziegfeld, 420 Lexington Ave., New York 17, N. Y.

Apr. 26-27, Society for Advancement of Management: Management engineering conference, Hotel Statler, New York. Society's address: 74 Fifth Ave., New York 11, N. Y.

Apr. 29-May 3, Electrochemical Society: Spring meeting, Mark-Hopkins hotel, San Francisco. Society's address: 216 W. 102nd St., New York 25, N. Y. Secretary: R. M. Burns.

Apr. 30-May 2, Association of Iron & Steel Engineers: Spring meeting, Lord Baltimore hotel, Baltimore. Association's address: 1010 Empire Bldg., Pittsburgh 22, Pa. Managing director: T. J. Ess.

Apr. 30-May 2, Metal Treating Institute: Spring meeting, Roosevelt hotel, New Orleans. Institute's address: 271 North Ave., New Rochelle, N. Y. Secretary: C. E. Herington.

May 2-4, Industrial Fasteners Institute: Annual meeting, Homestead, Hot Springs, Va. Institute's address: 1517 Terminal Tower, Cleveland 13, O. Secretary: R. B. Belford.

May 3-9, American Foundrymen's Society: Biennial convention and show, Convention Hall, Atlantic City, N. J. Society's address: Golf & Wolf Rds., Des Plaines, Ill. Secretary: William W. Maloney.

May 6-9, American Institute of Chemical Engineers: Spring meeting, Roosevelt hotel, New Orleans. Institute's address: 120 E. 41st St., New York 17, N. Y. Secretary: F. J. Van Antwerpen.

May 6-9, American Steel Warehouse Association: Annual meeting, Fairmont hotel, San Francisco. Association's address: 442 Terminal Tower, Cleveland, O. Executive secretary: Robert G. Welch.

May 6-9, Liquefied Petroleum Gas Association Inc.: Annual meeting and exhibit, Conrad Hilton hotel, Chicago. Association's address: 11 S. LaSalle St., Chicago 1, Ill. Secretary: Arthur C. Kreutzer.

May 7-9, American Mining Congress: Coal convention, Netherland Plaza, Cincinnati. Congress' address: 1102 Ring Bldg., Washington 6, D. C. Executive vice president and secretary: Julian D. Conover.

May 7-11, American Welding Society: National spring technical meeting and welding show, Hotel Statler and Memorial Auditorium, Buffalo. Society's address: 33 W. 39th St., New York 18, N. Y. Secretary: J. G. Magrath.

May 9-11, Investment Casting Institute: Spring meeting and exhibit, New Yorker hotel, New York. Institute's address: 27 E. Monroe St., Chicago 3, Ill. Executive secretary: Harry P. Dolan.

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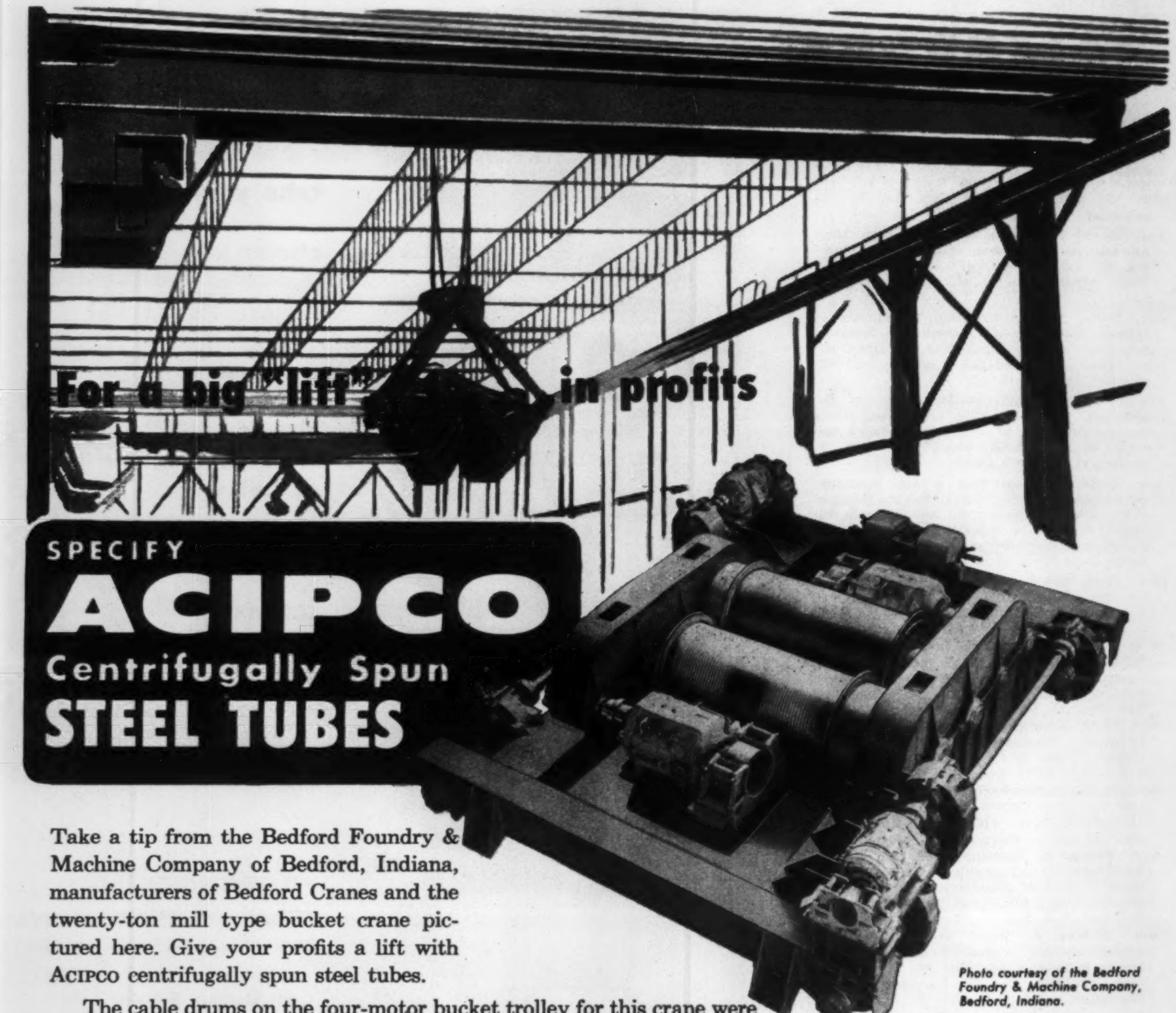
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Photo courtesy of the Bedford Foundry & Machine Company, Bedford, Indiana.

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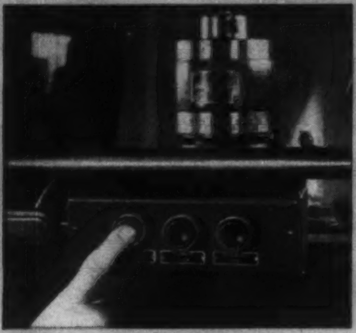

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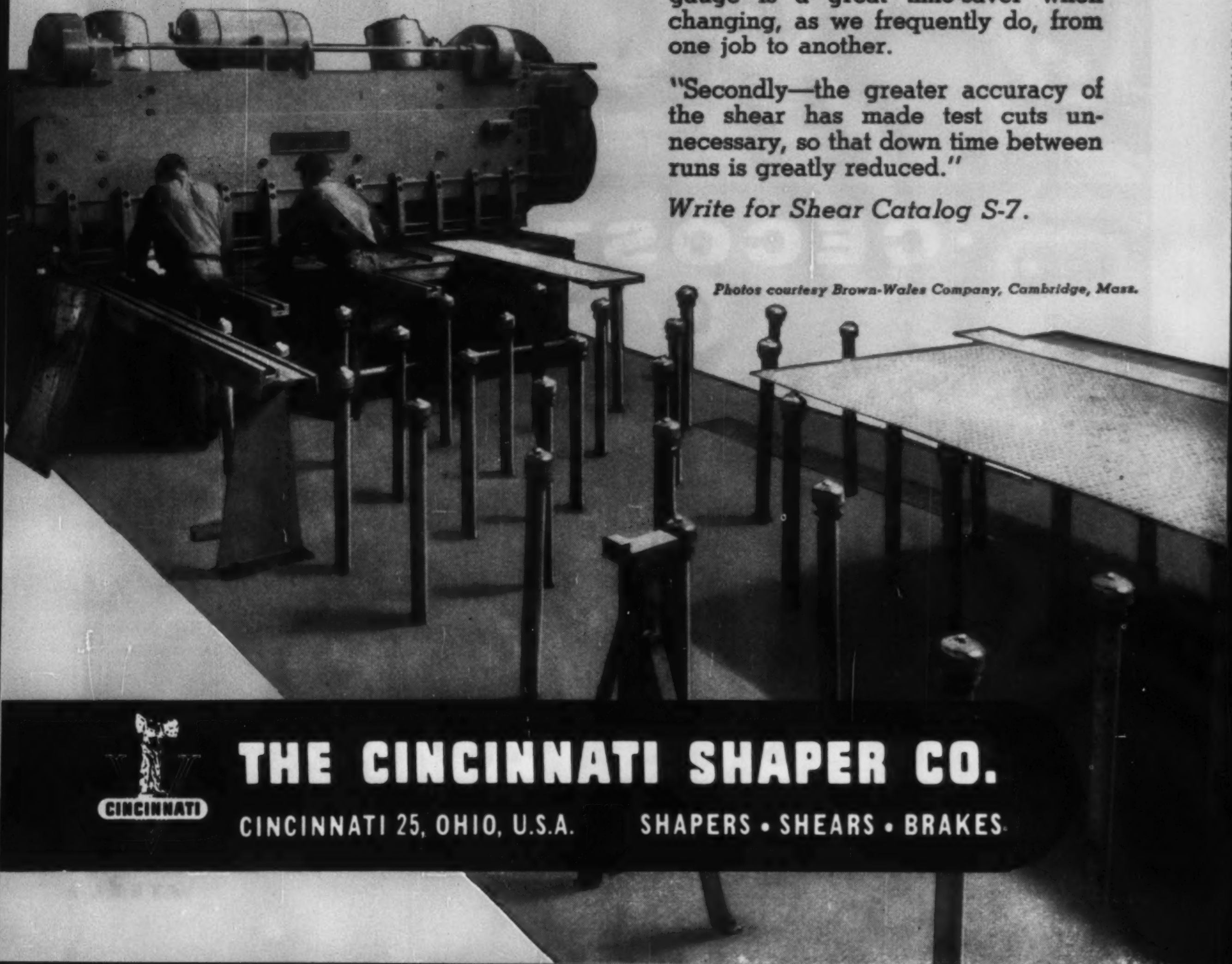

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All photographs courtesy Automotive Fabricators Inc.

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NO. 18

Note—This article contains completely up-to-date information. It replaces your old sheet No. 9.

PROPERTIES AND CHARACTERISTICS OF ALUMINUM CASTING ALLOYS

CHOOSING the proper aluminum casting alloy and heat-treatment requires a complete knowledge of the service conditions of the part under consideration. The alloys, heat treatments and various casting methods in common use must also be understood.

There are over thirty recognized casting alloys, with as many as five different heat-treatment possibilities for some. This results in a large number of choices from which to satisfy individual requirements. Because of these many alloy and heat-treatment combinations the possible range of typical mechanical properties varies widely.

Frequently, commercial castings do not have critical service requirements, and in such cases the foundryman should be consulted to ascertain the most economical alloy and production method which will do the job.

However, in most instances castings are designed for maximum efficiency, and in such cases, the alloy and heat treatment must be carefully selected from those available. In doing this, the designer, with his greater knowledge of the service requirements for the casting, must confine the choice of alloys to those which provide the necessary properties. He must then be guided by the foundryman in the final choice, as the alloy which looks best in the tables may have some production characteristics which would make it less desirable on an overall basis than other eligible alloys. The foundryman is in the best position to advise on such factors as availability, relative ingot costs, production costs and reproducibility of results. When this is coordinated with the designer's knowledge of service requirements such as strength, hardness, corrosion resistance, impact strength and machinability, the best possible selection will result.

As a result of this coordination, changes from initial design may be indicated which will improve design efficiency, or lower production costs, or both. For instance, a casting having sound design from every other standpoint may have a size or shape pointing to problems of distortion in heat treating which could be minimized through design changes.

Factors to Consider

The production and service requirements have a large bearing on the casting method, as do size and shape of part. For example, castings required in fairly large numbers, should be made either by permanent mold or die casting process, provided the size and design features of casting and available alloys are suitable.

The sand casting process is usually confined to producing parts required in small quantities, those having hollow cavities and complex arrangement of ribs, pockets, etc., and to those whose size makes them unsuited for casting in metal molds. In many cases it will be advantageous to redesign a part to make it adaptable for production by either permanent mold or die casting method. Sand casting usually requires minimum tooling charge, but unit price of castings and the finished part is high. Permanent molding and die casting involves higher tooling charge, but unit price is lower, particularly for longer runs. Die castings are the extreme, usually involving highest tooling charge and lowest piece price on large quantities.

Once the casting method is determined, the alloy choice is narrowed down appreciably.

Next to be considered are the service requirements. If high strength is necessary, that ordinarily eliminates the non-heat-treatable alloys when using an efficient design. This can be further and rapidly narrowed down when the remaining requirements such as leak tightness, corrosion resistance, machinability and others are considered.

In some instances, one certain property may be required to the maximum degree—for example, highest possible yield strength. This immediately narrows down the alloy and heat treatment choice as well as casting method to a possible one or two, and bigger compromises will have to be made for the other requirements, particularly ductility.

In other cases the large size and shape of a casting may not permit the use of a "solution heat-treatment," but will limit it to use of a "straight aging treatment" taking place in approximate temperature range of 300°F to 500°F, or to no treatment at all, thereby sacrificing, to a degree, some of the mechanical properties and slightly decreasing machinability.

The reason for this limitation is the fact that the first half of a solution heat-treatment takes place at a temperature ranging between 930°F to 1,000°F, followed by rapid quench in water. At those temperatures, the mechanical strength of aluminum is practically zero and therefore large unsupported areas of the casting, or the whole casting at times, may sag or distort from its own weight. Sometimes the size and shape of part are such that it can withstand the effects of the high temperatures but cannot be quenched without danger of warping or cracking.

Die castings are always used in the as-cast condition, which limits the choice to one of alloy selection only.

To assist the designer in becoming familiar with the various casting processes, mechanical properties, and physical properties we refer him to these tables on the following pages:

Table #1—Typical Mechanical Properties of Aluminum Sand Castings

Table #2—Typical Mechanical Properties of Aluminum Permanent Mold Castings

Table #3—Typical Mechanical Properties of Aluminum Die Castings

Table #4—Alloy Selection Guide

Sand casting, permanent mold casting, and die casting are the more widely used production methods. However, in special cases the part may be produced more efficiently by other methods such as shell molding, plaster molding, investment casting or centrifugal casting.

CONTINUED ON NEXT PAGE ➡

SAND CASTING ALLOYS—TABLE 1

Alloy	H. T.[3]	Typical Mechanical Properties[1]					Casting and Service Characteristics[2]						
		Tensile Strength psi	Yield Strength psi	Elongation Per Cent in 2"	Hardness Brinnell 10/500	Fatigue psi	Feeding Ability	Pressure Tightness	Hot-Shortness	General Cast-ability	Machin-ability	Corrosion Resist-ance	Weld-ability[5]
43	AC	19,000	8,000	8.0	40	6,500	E	E	SL	E	F	VG	E
108	AC	21,000	14,000	2.5	55	8,000	VG	VG	MIN	VG	G	G	VG
122	T2	27,000	20,000	1.0	80	9,500	G	G	MOD	G	E	F	F
122	T61	41,000	40,000	(6)	115	8,500	G	G	MOD	G	E	F	F
142	T21	27,000	18,000	1.0	70	6,500	G	F	AP	F	VG	F	F
142	T571	32,000	28,000	.5	85	8,000	G	F	AP	F	VG	F	F
142	T77	28,000	25,000	2.0	75	9,500	G	F	AP	F	VG	F	F
195	T4[4]	32,000	16,000	8.5	60	6,000	G	G	AP	F	G	G	F
195	T6	36,000	24,000	5.0	75	6,500	G	G	AP	F	VG	G	F
195	T62	40,000	30,000	2.0	90	7,000	G	G	AP	F	E	G	F
212	AC	23,000	14,000	2.0	65	8,000	G	G	MOD	G	E	F	G
214	AC	25,000	12,000	9.0	50	5,500	F	F	MOD	F	E	E	G
B214	AC	20,000	13,000	2.0	50	....	F	F	MOD	G	E	E	G
F214	AC	21,000	12,000	3.0	50	....	F	F	MOD	F	E	E	G
220	T4	46,000	25,000	14.0	75	7,000	F	F	MOD	F	E	E	F
319	AC	27,000	18,000	2.0	70	10,000	E	E	SL	E	G	G	G
319	T6	36,000	24,000	2.0	80	10,000	E	E	SL	E	G	G	G
355	T51	28,000	23,000	1.5	65	7,000	E	E	SL	E	E	VG	VG
355	T6	35,000	25,000	2.5	80	8,500	E	E	SL	E	E	VG	VG
355	T61	39,000	35,000	1.0	90	....	E	E	SL	E	E	VG	VG
355	T7	38,000	36,000	0.5	85	8,500	E	E	SL	E	E	VG	VG
355	T71	35,000	29,000	1.5	75	10,000	E	E	SL	E	G	VG	VG
356	T51	25,000	20,000	2.0	60	7,500	E	E	SL	E	G	E	VG
356	T6	33,000	24,000	4.0	70	8,000	E	E	SL	E	G	E	VG
356	T7	34,000	30,000	2.0	75	....	E	E	SL	E	E	E	VG
356	T71	28,000	21,000	4.5	60	....	E	E	SL	E	G	E	VG

NOTES:

1. Properties determined on standard tensile test bars cast under favorable conditions and properly heat-treated, when applicable.
2. Ratings: E, excellent; VG, very good; G, good; F, fair—apply to all castings and service characteristics except Hot-Shortness; AP, appreciable; MOD, moderate; MIN, minor; SL, slight.
3. AC, as cast.
4. On standing at room temperature for several weeks, properties approach those of T6 condition.
5. Weld before heat-treating, using appropriate filler rod.
6. Less than 0.5% elongation.

PERMANENT MOLD CASTING ALLOYS—TABLE 2

Alloy	H. T.[3]	Typical Mechanical Properties[1]					Casting and Service Characteristics[2]						
		Tensile Strength psi	Yield Strength psi	Elongation Per Cent in 2"	Hardness Brinnell 10/500	Fatigue psi	Feeding Ability	Pressure Tightness	Hot-Shortness	General Cast-ability	Machin-ability	Corrosion Resist-ance	Weld-ability[5]
43	AC	23,000	9,000	10.0	45	....	VG	E	SL	E	F	VG	E
A108	AC	28,000	16,000	2.0	70	....	VG	VG	MIN	VG	G	G	VG
122	T52	35,000	31,000	1.0	100	....	G	G	MOD	G	E	F	F
122	T551	37,000	35,000	......	115	8,500	G	G	MOD	G	E	F	F
122	T65	48,000	36,000	......	140	9,000	G	G	MOD	G	E	F	F
A132	T551	36,000	28,000	.5	105	13,500	G	VG	MIN	G	F	G	G
A132	T65	47,000	43,000	.5	125	....	G	VG	MIN	G	F	G	G
D132	T5	36,000	28,000	1.0	105	13,500	VG	VG	MIN	VG	G	F	G
138	AC	30,000	24,000	1.5	100	....	....	G	MIN	F	G	....	....
142	T571	40,000	34,000	1.0	105	10,500	F	F	AP	F	VG	G	F
142	T61	47,000	42,000	.5	110	9,500	F	F	AP	F	VG	G	F
B195	T4[4]	37,000	19,000	9.0	75	9,500	G	G	MOD	G	G	G	G
B195	T6	40,000	26,000	5.0	90	10,000	G	G	MOD	G	G	G	G
B195	T7	39,000	20,000	4.5	80	9,000	G	G	MOD	G	G	G	G
A214	AC	27,000	16,000	7.0	60	....	F	F	AP	F	E	E	G
319	AC	34,000	19,000	2.5	85	....	E	E	SL	E	G	G	G
319	T6	40,000	27,000	3.0	95	....	E	E	SL	E	G	G	G
355	T51	30,000	24,000	2.0	75	....	E	E	SL	E	VG	VG	VG
355	T6	43,000	27,000	4.0	90	10,000	E	E	SL	E	VG	VG	VG
355	T62	45,000	40,000	1.5	105	10,000	E	E	SL	E	E	VG	VG
355	T7	40,000	30,000	2.0	85	10,000	E	E	SL	E	VG	VG	VG
355	T71	36,000	31,000	3.0	85	10,000	E	E	SL	E	VG	VG	VG
356	T6	40,000	27,000	5.0	90	13,000	E	E	SL	E	G	E	VG
356	T7	33,000	24,000	5.0	70	11,000	E	E	SL	E	G	E	VG
363	AC	35,000	23,000	2.7	85	....	E	VG	SL	E	E	G	E
363	T6	48,000	28,000	6.5	90	....	E	VG	SL	E	E	VG	E
750	T5	20,000	8,500	10.0	45	9,000	....	....	....	....	E	....	....

NOTES:

1. Properties determined on standard tensile test bars cast under favorable conditions and properly heat-treated, when applicable.
2. Ratings: E, excellent; VG, very good; G, good; F, fair—apply to all castings and service characteristics except Hot-Shortness; AP, appreciable; MOD, moderate; MIN, minor; SL, slight.
3. AC, as cast.
4. On standing at room temperature for several weeks, properties approach those of T6 condition.
5. Weld before heat-treating, using appropriate filler rod.

DIE CASTING ALLOYS—TABLE 3

		Typical Mechanical Properties[1]					Casting and Service Characteristics[2]					
Alloy	**Condition[3]**	**Tensile Strength psi**	**Yield Strength psi**	**Elongation Per Cent in 2"**	**Hardness Brinnell 10/500**	**Fatigue psi**	**Mold Filling Capacity**	**Hot-Shortness**	**Die Solder Tendency**	**Machin-ability**	**Corrosion Resistance**	**Weld-ability**
13	AC	39,000	21,000	2.0	....	19,000	E	VL	E	F	VG	not recommended
A 13	AC	35,000	16,000	3.5	....	....	VG	VL	VG	F	VG	
43	AC	30,000	16,000	9.0	....	17,000	G	MIN	F	F	VG	
218	AC	45,000	27,000	8.0	....	23,000	F	AP	F	E	E	"
360	AC	44,000	27,000	3.0	....	19,000	E	VL	G	F	G	"
A360[4]	AC	41,000	23,000	5.0	....	18,000	E	VL	G	F	E	"
380	AC	45,000	26,000	2.0	....	20,000	E	MOD	E	G	G	"
A380[4]	AC	46,000	25,000	3.0	....	19,000	E	MOD	E	G	G	"
384	AC	46,000	27,000	1.0	....	21,000	E	MOD	E	G	G	"

NOTES:

1. Properties determined from standard test bars cast under favorable conditions.
2. Ratings: E, excellent; VG, very good; F, fair—apply to all castings and service characteristics except "hot-shortness"; AP, MOD, MIN, VL apply to "hot-shortness" only.
3. As cast.
4. In A360 and A380, the iron content is controlled more closely than in 360 and 380 alloys.

SELECTION GUIDE—TABLE 4

Major Property Wanted	Sand Cast	Perm. Mold	Die Cast
General purpose— Low strength arranged in order of decreasing castability	43 108 212 214	43 A108 A214	13 A 13 43
General purpose— Heat-treated[1] good balance of all properties for most applications	355-T6 356-T6 319-T6 195-T6	355-T6 356-T6 319-T6 B195-T6	380 A380 360 A360
Best castability for complex castings with thin sections—arranged in order of decreasing castability	43 319 356 108 355	43 319 356 M108 355	A360; 360 A 13; 13 43
High ductility and **shock resistance** arranged in order of decreasing properties	220-T4 195-T4 214[2] 356-T6 319 43	A214 B195-T4 356-T6 363-T6 319 43	218 A360 43
Pressure tight—Low stressed	43 108 319	43 A108 319	A360 A 13 43
Pressure tight—High stressed	356 355 319	356 355 319 363	A360

Major Property Wanted	Sand Cast	Perm. Mold	Die Cast
Corrosion Resistance	43 214 220 356 355 319	43 A214 356 355 319 363	218 A360
Ornamental and Architectural Applications—also food handling, dairy equipment, cooking utensils and marine fittings	43 214[2] B214[2] F214[2]	43 A214[2]	43 218[2]
Piston Alloys—good properties at operating temperatures	122 142	122 A132 D132 142	384 85
Other alloys having good properties at moderate temperatures	214	138 A214	13 360
Good machinability—Heat-treated castings machine better than those in as-cast condition, and generally those having highest hardness machine better than the softer ones in any one alloy	122 212 214 B214 F214 220-T4 195 319	122 355 363 A214 A108 319	218 380 A380

NOTES:

1. Except die castings.
2. These alloys take anodized finish without appreciable discoloration.

More detailed assistance with design, alloy selection, fabrication, and heat-treatment procedure is obtainable through any Kaiser Aluminum sales office located in principal cities, or write to Kaiser Aluminum & Chemical Sales, Inc., 1924 Broadway, Oakland 12, California.

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For substantial savings in surface grinding, use Simonds Abrasive Company Segments. Mechanically accurate in shape and size, they fit all segmental chucks, require no sulphuring, and grind more uniformly because of greater uniformity in grade and structure. Use them for gap type segmented wheels for fast, cool stock removal on large size pieces—and for solid type segmented wheels for small pieces chucked together. Write for bulletin ESA—188.

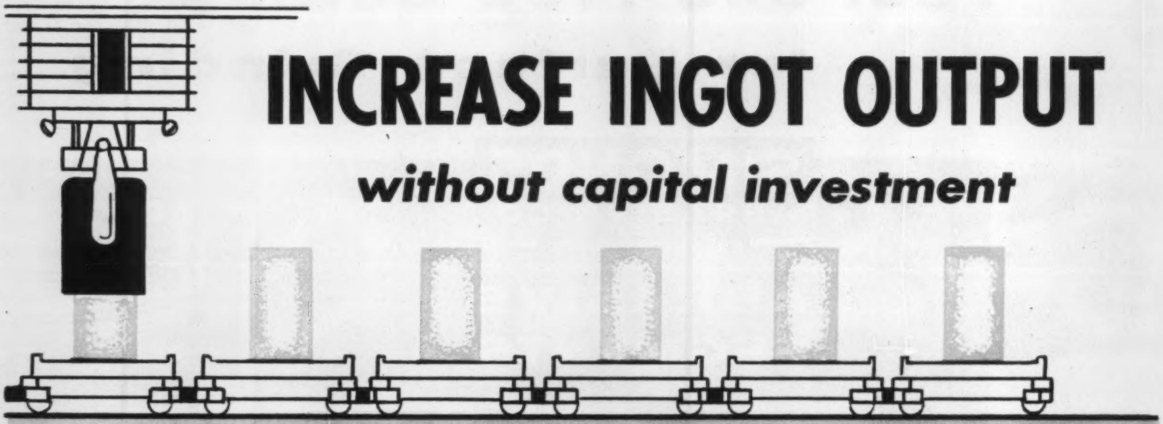
SIMONDS ABRASIVE COMPANY • PHILADELPHIA 37, PA.

Branch Warehouses: Boston, Detroit, Chicago, Portland, San Francisco. Distributors in Principal Cities

Division of Simonds Saw and Steel Co., Fitchburg, Mass.

CALL YOUR SIMONDS DISTRIBUTOR

LOCAL STOCK
FAST SERVICE



INCREASE INGOT OUTPUT

without capital investment

with

"ON-LOCATION" OXYGEN GENERATORS

More than 700 Successful Installations

Full utilization of oxygen in blast furnaces, open hearths and steel converters offers the Steel Industry the most economical means of increasing ingot output. And, of course, a captive generator is essential for the use of oxygen in adequate quantity.

We will furnish and install an "On-Location" oxygen and/or nitrogen generating station to suit your present and expanding oxygen requirements —on a lease basis (you can operate and maintain or Air Products will operate and maintain), with price guaranteed at all levels of consumption, *without capital investment by you.*

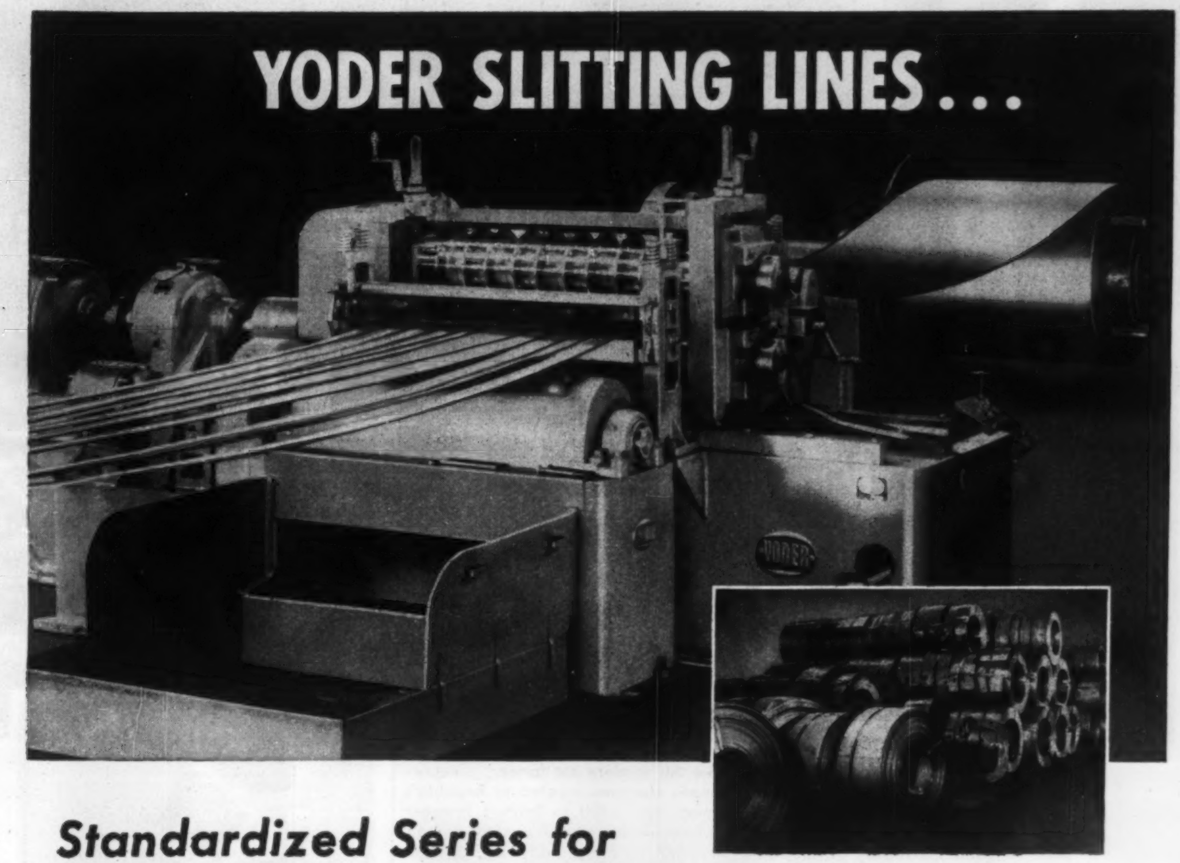
We design and manufacture:
Generators for unlimited quantities of oxygen and nitrogen regardless of size, purity or cycle.

If you will send us details regarding your requirements, we will give you a close estimate of the savings you can expect with Air Products "On-Location" Oxygen and/or Nitrogen Generators installed at your plant.

LOW COST OXYGEN...NITROGEN

Air Products
INCORPORATED
Dept. N, Box 538, Allentown, Pa.

YODER SLITTING LINES...



Standardized Series for

LOW FIRST COST AND OPERATING COST!

A relatively small, low-cost Yoder slitting line offers attractive savings possibilities and high production in slitting small and medium coil sizes and strip gauges. Yoder has standardized a series of such machines, affording a rare combination of low cost and productive capacity amply sufficient for the needs of the great majority of sheet metal fabricators and custom slitting shops. Supplementing the standardized series are *special models for slitting big coils and heavy gauges at high speeds.*

For requirements as low as 100 tons per month, one of the standardized Yoder slitting lines will pay for itself in short order. The savings PER TON increase rapidly with decrease in coil size and width of strands to be slit.

Another important advantage gained by fabricators having their own slitter is the ability, from a relatively small stock of standard width coils, to meet expected and unexpected needs for slit strands in a few hours. This means easier production planning and greatly reduced strip inventories, in addition to lower prices and quicker deliveries of their strip purchases.

Yoder Slitter Book contains basic information on the economics and mechanics of slitter operation, with time and cost studies, production records and other valuable data. Send for it.

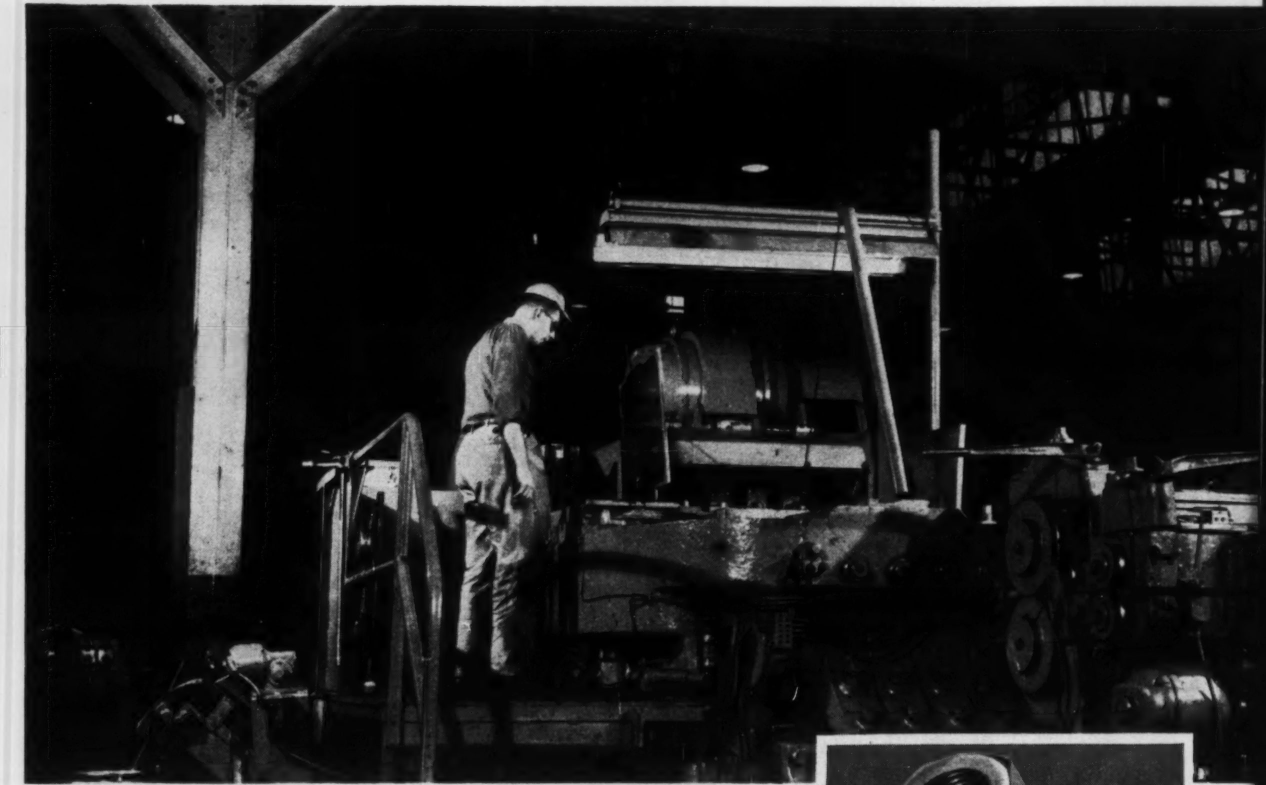
THE YODER COMPANY • 5502 Walworth Ave. • Cleveland 2, Ohio

ENGINEERING YODER MANUFACTURING

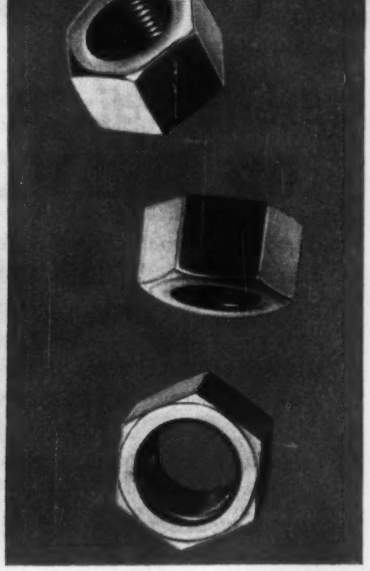
ROTARY SLITTING LINES

COLD ROLL FORMING MACHINES

ELECTRIC-WELD PIPE AND TUBE MILLS



SPECIALIZED PRODUCTION EQUIPMENT, like this modern nut former, is representative of hundreds of high-speed automatic machines located at Republic's giant Bolt and Chain Division. From incoming steel billet to finished fastener product, every step in manufacture is controlled by skilled workmen using machine tools specifically developed to maintain uniform quality in each type of fastener.



REPUBLIC

World's Widest Range of Standard Steels

The case for
FASTENER SELECTION

Modern facilities increase fastener dependability

It takes an expert to build just one good fastener. But to turn out countless thousands of quality fasteners identical in every detail, in performance and dependability, it takes a vast team of specialists, both men and machines.

That's what we have at Republic—a coordinated team of individual experts, working with the finest available equipment. A team that builds bolts and nuts every step of the way from raw ore to finished product, eliminating any chance of errors being introduced by outside suppliers.

As a result, when you specify Republic, you can count on consistent uniformity from one unit to the next, year in and year out. You get unswerving quality and dependability in each fastener, in any quantity.

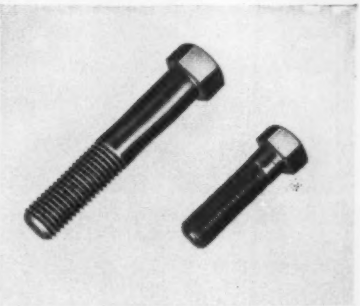
When you leave no stone unturned to secure quality in your assembly components, you can't afford less than the best in fasteners. And yet Republic fasteners cost more than other brands.

So don't just order fasteners, *select* Republic and be sure of the best. Your Republic Bolt and Chain Division representative or distributor will be glad to work with you to make sure you get exactly the right fastener to suit your application. He is backed by an array of 20,000 standard types and sizes plus 8,000 specials. And, if you should need something still different, Republic can undertake volume production of headed and threaded items manufactured to your exact specifications.

Mail the coupon today for full information.

TOP-NOTCH PRODUCTION FACILITIES go to work as an extension of your own plant when you have your stamped and drawn parts fabricated by Republic's Pressed Steel Division. This truck pedal shaft bracket is one of a wide variety of steel parts mass-produced for large-volume manufacturers. Send coupon for data.

DEPENDABLE TUBULAR PRODUCTS begin with top-quality carbon steel and stainless steel tubing. Specify Republic ELECTRUNITE® Tubing to be sure of uniform diameter, wall thickness, concentricity, strength and ductility. These characteristics back your production facilities, simplifying and speeding output of superior parts, like the immersion heater casing shown above. For complete information on ELECTRUNITE Tubing, mail coupon today.



UNIFORM DEPENDABILITY IN ALL SIZES is yours no matter what type of Republic fastener you require. Take Hex Head Cap Screws for example. Republic offers fine or coarse threads to suit your application in diameters from ¼ inch to 1½ inches inclusive, and lengths up to 12 inches. Send coupon for literature.

REPUBLIC STEEL

and Steel Products

REPUBLIC STEEL CORPORATION
Dept. C-1546
3120 East 45th Street, Cleveland 27, Ohio

Please send me complete information on:
- ☐ Bolts and Nuts
- ☐ Pressed Steel Fabricating Facilities
- ☐ ELECTRUNITE Carbon and Stainless Steel Tubing
- ☐ Hex Head Cap Screws

Name____

Company____

Address____

City________________________Zone______State___________

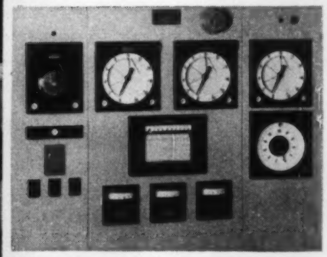
How Morgan stress relieving insures maximum design strength

● STRESS RELIEVING is one of many reasons why Morgan cranes provide longer, completely safe service under *any* operating conditions. Trolley frames, end carriages, trucks, drums, bearing caps, stripper barrels and rams, pit rams . . . all are stress relieved in Morgan's huge furnace capable of handling loads up to 250,000 pounds.

Morgan's stress relief furnace, one of the largest in the world, can raise temperatures 200 degrees Fahrenheit per hour up to 1750° F.

Stress relieving is still another example of the advanced design and construction features that make Morgan cranes the best in the business.

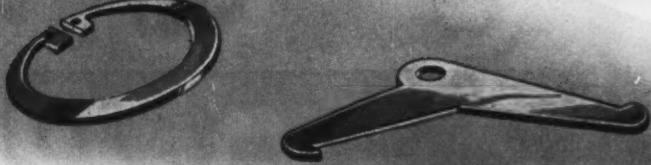
Performance records prove that Morgan cranes cost less to operate and maintain. Let our representative show you how to save the most by buying the best . . . Morgan!



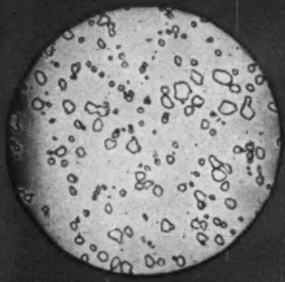
● Stresses built up in welding process are relieved in this 52 x 20 x 15 foot furnace. The 48 dual fuel burners are divided into three temperature zones, each zone controlled by an electronic potentiometer. Safety devices include high limit temperature controls, fuel shut-off valves. Combustion safeguards insure against over-heating.

The Morgan Engineering Company, founded in 1868, manufactures overhead electric traveling cranes, gantry cranes, open hearth special cranes, plate mills, blooming mills, structural mills, shears, saws, and auxiliary equipment.

THE
MORGAN
ENGINEERING CO. Alliance, Ohio



consistent uniformity!

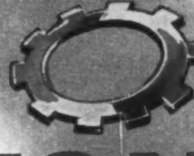


SPHEROIDIZED . . .

for easier cold forming

PEARLITIC . . .

for easier blanking procedure



WEIRTON

high carbon strip cold-rolled spring steel

Manufacturers throughout the nation find Weirton cold-rolled spring steel consistently produces best results in a wide variety of products.

Weirton supplies spheroidized-annealed cold-rolled spring steel for operations where superior forming qualities are necessary. Simple and economical fabrication is assured by the exceptional ductility of the controlled grain structure.

Where clean, economical blanking is the major requirement, Weirton supplies pearlitic steel structure that is temper-rolled in controlled hardness and tensile strength.

Both structures are available for specific heat treating and hardness. And in both structures, Weirton high carbon cold-rolled spring steel possesses five highly important characteristics: 1. Uniform chemical and physical properties. 2. Exact consistency of grain structure. 3. Accurate response to heat treatment. 4. Exceptional uniformity of gauge and width. 5. Controlled decarburization limits. . . . Why not let Weirton help make your product better?

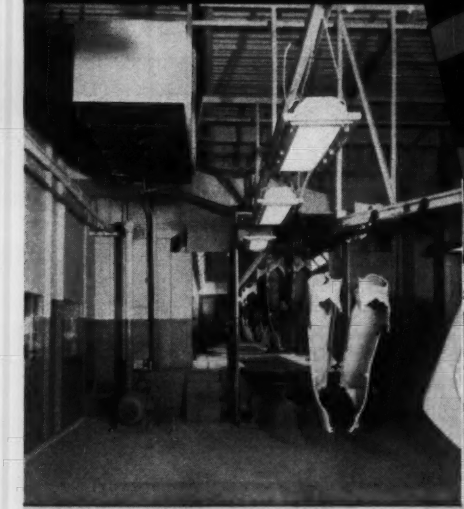
WEIRTON STEEL COMPANY

WEIRTON STEEL COMPANY
Weirton, West Virginia

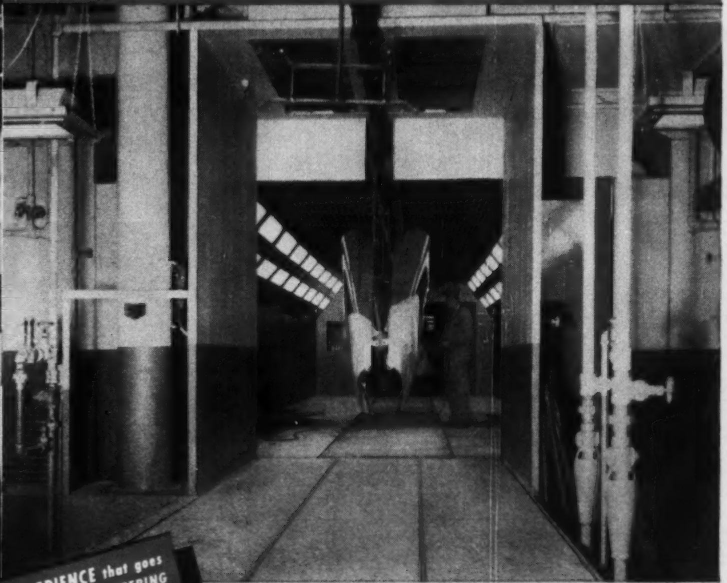
NATIONAL STEEL CORPORATION

COMPLETE *Finishing* SYSTEMS

. . . for ENAMELS • LACQUER • PAINT • VARNISH



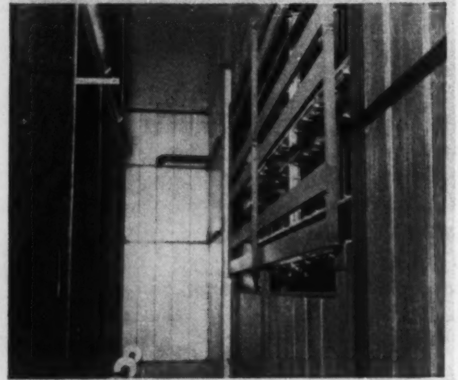
Mahon ventilated Flash-Off Enclosure between Hydro-Filter Spray Booth and the Finish Baking Oven on the roof above.



Mahon Down-Draft Hydro-Filter Spray Booth specially designed to accommodate a variety of automobile parts other than body parts.

Mahon filtered Air Supply System and Mahon Finish Baking Oven installed on the roof of the plant.

. . . the EXPERIENCE that goes into the PLANNING and ENGINEERING of MAHON EQUIPMENT is the item of GREATEST VALUE to YOU!



Interior of Mahon Air Supply System showing one bank of Filters of the Air Filtering Equipment and the Direct Gas-Fired Air Preheating Unit.

Small Parts FINISHING LINE OCCUPIES MINIMUM SPACE INSIDE PLANT!

To meet requirements in this particular installation, where floor space was a restricting factor, Mahon engineers built the space-consuming units of the finishing system on the roof of the plant. This is not unusual . . . today, Mahon can point to hundreds of installations in which major parts or entire finishing systems have been built and housed on the roof of plants where floor space inside the plant was at a premium. If you are contemplating new finishing equipment, you, too, will want to discuss methods, equipment requirements and possible arrangements with Mahon engineers. You will find them better qualified to advise you, and better qualified to do the all-important planning, engineering and coordinating of equipment which is the key to fine finishes at minimum cost. And, if you care to investigate, you will find that Mahon equipment will serve you better . . . because, Mahon equipment is engineered better and built better for more economical operation over a longer period of time. See Mahon's Insert in Sweet's Plant Engineering File, or write for Catalog A-656. Better still, why not have a Mahon engineer call at your convenience.

THE R. C. MAHON COMPANY • Detroit 34, Michigan
SALES-ENGINEERING OFFICES in DETROIT, NEW YORK and CHICAGO

Engineers and Manufacturers of Complete Finishing Systems—including Metal Cleaning, Pickling and Rust Proofing Equipment, Hydro-Filter Spray Booths, Dip and Flow Coaters, Filtered Air Supply Systems, Drying and Baking Ovens, Cooling Tunnels, Heat Treating and Quenching Equipment for Aluminum and Magnesium, and other Units of Special Production Equipment.

MAHON

There's MORE rating selection available in Allis-Chalmers MOTORS

To meet industry needs...

Allis-Chalmers Offers Complete Line of Rib-Type MOTORS from 1 to 100 Hp

Allis-Chalmers, a pioneer in rib-type TEFC motor design, is the only leading manufacturer offering a complete line of these motors from 1 to 100 hp. The many cost-saving features of deep-rib construction can be applied in a variety of uses . . . both indoors and out.

Here's why these motors can cut your costs:

MORE cooling surface — Rib-type design provides reserve cooling capacity in dirty locations.

MORE iron—Cast-iron frame and external parts assure rigidity and resistance to corrosion.

MORE copper — Allis-Chalmers greater use of copper increases electrical life.

MORE lubrication provisions — Large grease reservoirs surround bearings. Provision made for in-service relubrication — important where moisture or corrosive vapors contaminate grease.

As a new machinery component or as replacement, specify Allis-Chalmers. To find out more, contact your nearby Allis-Chalmers distributor, district office, or write Allis-Chalmers, General Products Division, Milwaukee 1, Wisconsin.

A-4936

ALLIS-CHALMERS

Set them, forget them—they stay tight

New high torque Unbrako self-locking socket set screws

Research has proved that the tighter you seat a set screw the better it works. So we designed a set screw that can be tightened tighter than ever before. We formed a deeper socket. We put a radius in the socket corner. We developed fully formed threads. We established new methods of heat treatment in atmosphere-controlled furnaces. All this, plus the well-known self-locking knurled cup point that keeps it tight.

Let's see what the changes in the UNBRAKO socket mean to you. The deeper socket gives you more purchase with the wrench. Since more wrench can be put in the socket, you can tighten the screw much tighter. And you won't ream the socket or round the corners of the wrench. The radius in the UNBRAKO corners eliminates the sharp corners where cracks start. Ordinary socket screws have sharp corners which often crack even at torques much lower than those recommended for UNBRAKOs.

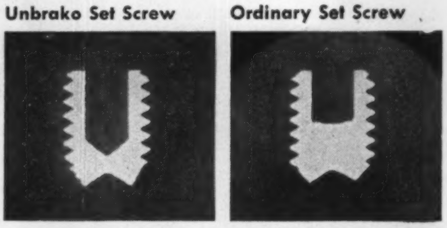
You can't buy a better set screw than an UNBRAKO. See your authorized industrial distributor today. Or write STANDARD PRESSED STEEL CO., Jenkintown 33, Pa.

Up to 40% higher tightening torque— a new Unbrako feature

RECOMMENDED SOCKET SET SCREW TIGHTENING TORQUES (Inch-Pounds)

SCREW SIZE	UNBRAKO	SET SCREW B	SET SCREW C	MINIMUM DIFFERENTIAL %
#4	5	3.9	3.5	28
#5	9	7.8	7.4	15
#6	9	7.8	7.4	15
#8	20	14.7	14.5	36
#10	33	26.5	25	25
1/4	87	62	60	40
5/16	165	122	125	32
3/8	290	198	225	29
7/16	430	309	350	23
1/2	620	460	500	24
5/8	1225	1106	1060	11
3/4	2125	1540	1800	18
7/8	5000	3660	4600	9
1	7000	5025	6500	8

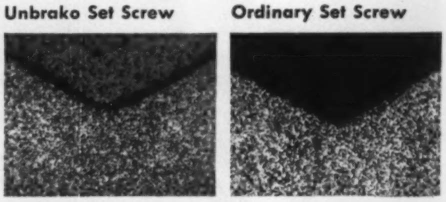
ALL UNBRAKOs can withstand higher tightening torques than ordinary socket set screws. For example, the recommended torque for a ¼" UNBRAKO is 87 inch-pounds—40% greater than that recommended for an ordinary socket set screw.



Unbrako Set Screw

Ordinary Set Screw

COMPARE the socket depth. The UNBRAKO socket at the left is much deeper than the socket in the ordinary set screw at the right. This additional depth in the UNBRAKO socket gives you more purchase with the wrench—you can set an UNBRAKO much tighter.



Unbrako Set Screw

Ordinary Set Screw

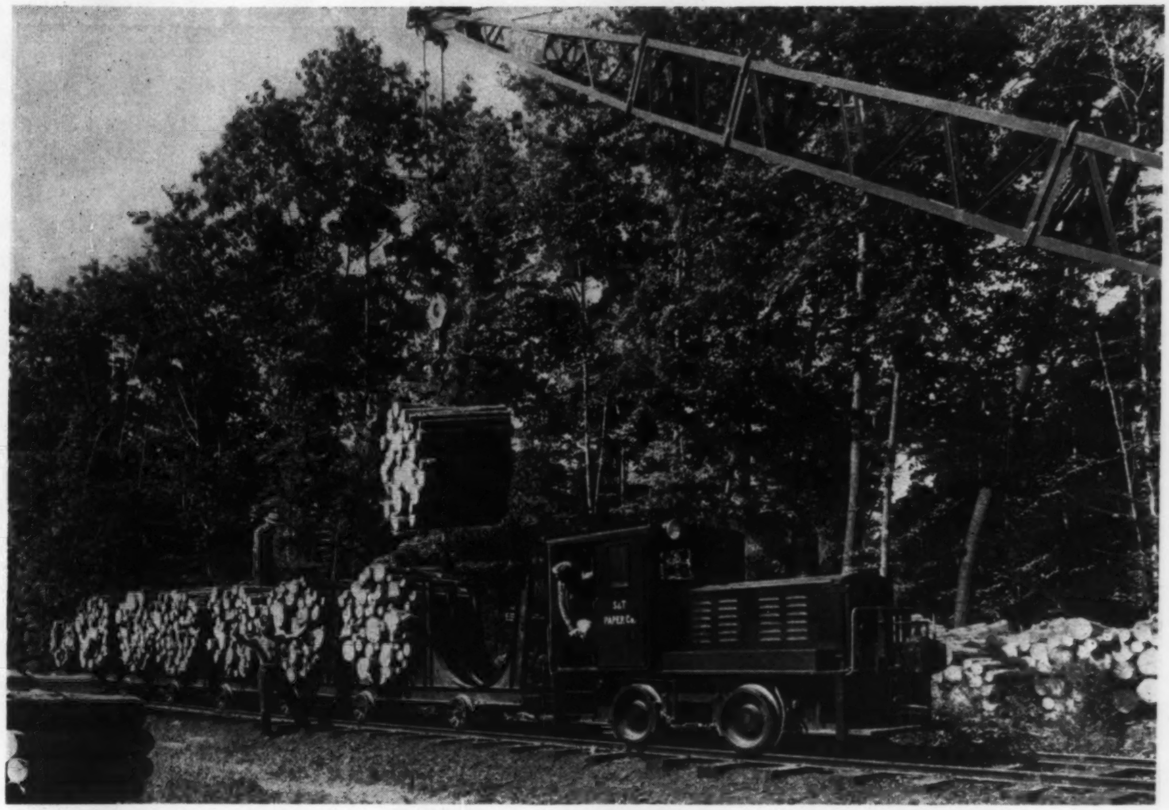
THE RADIUS put in UNBRAKO socket corners eliminates the sharp corners where cracks start. They distribute the stresses developed when tightening torques are applied. You can seat an UNBRAKO tighter without screw failure. Ordinary set screws have sharp corners which often crack when tightened even at lower recommended torques.

STANDARD PRESSED STEEL CO.

UNBRAKO SOCKET SCREW DIVISION

SPS

JENKINTOWN PENNSYLVANIA



Plymouth's Greater Traction

MAKES THE GRADE!

"Smoother starting and superior traction" are the features of their 8-ton Model DLHT Plymouth Locomotive most welcomed by Stevens & Thompson Paper Co., Greenwich, N. Y.

Hauling heavy carloads of cordwood close to half-a-mile for processing is a 48-hour-per-week operation for the Plymouth owned by this well-known paper mill. Stevens & Thompson's operators say their 8-ton Diesel Locomotive takes the grades to storage pile with effortless power. "They've commented especially on smooth starting, too," said Lewis Boex, purchasing agent for the mill.

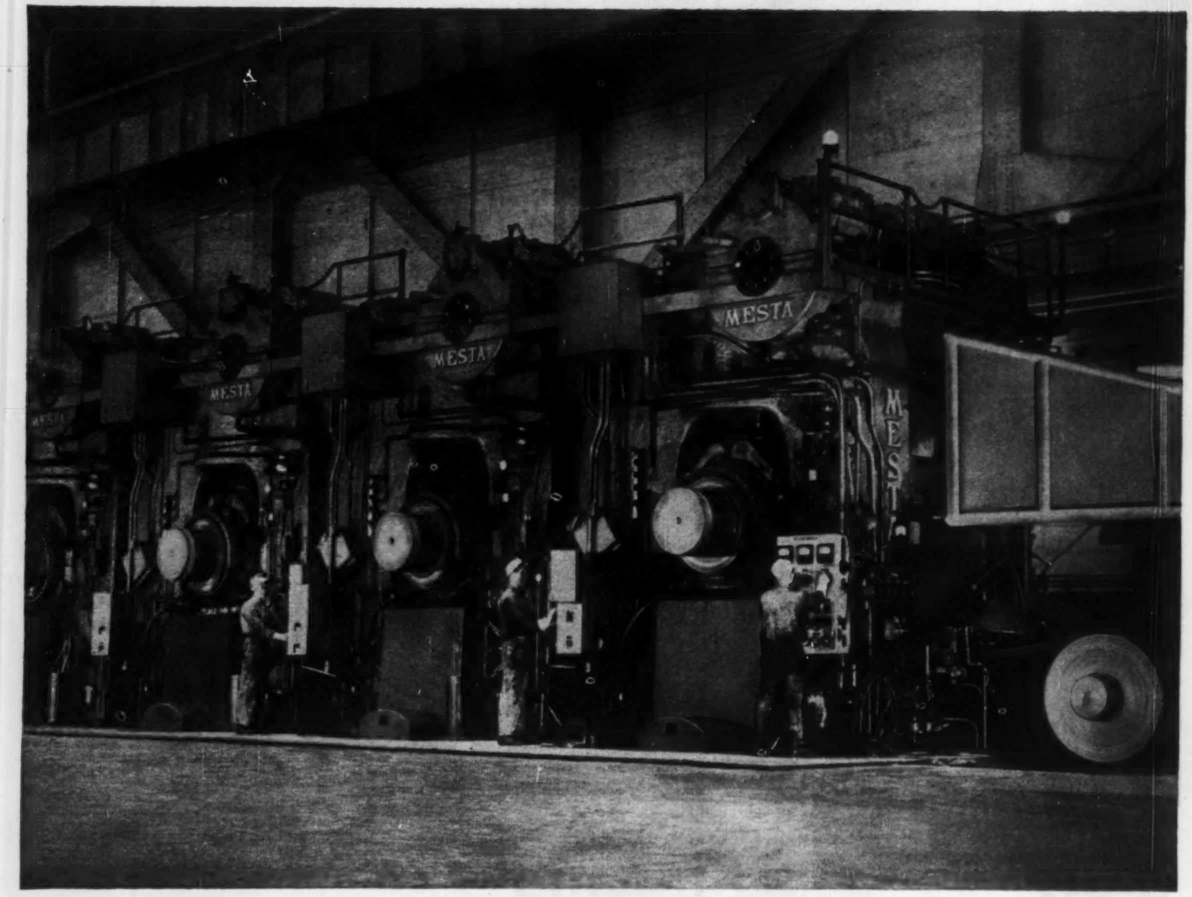
Plymouth's reliable efficiency and economical operation are making continuous hauling jobs more profitable for large and small companies throughout industry. Steady power—with substantial fuel savings per ton of materials hauled—is a universal benefit in models from 3 to 70 tons. Plymouth Locomotives, Gasoline or Diesel powered, are available with mechanical or Torqomotive Drive*.

For an engineering analysis showing how Plymouths can best fill your hauling needs, send a brief outline to Plymouth Locomotive Works, Division of The Fate-Root-Heath Company, Dept. A-1, Plymouth, Ohio.

PLYMOUTH® TORQOMOTIVES

*TORQOMOTIVE DRIVE: Plymouth Transmission Coupled to Hydraulic Torque-Converter

ALSO BUILDERS OF F-R-H CERAMIC MACHINERY



Full protection for back-up roll necks

When you use *Texaco Regal Oil* in the circulating systems of your roll stands, you're giving your back-up roll necks the best possible protection. That means smoother, more dependable operation, longer bearing life, lower maintenance costs.

Texaco Regal Oil is a specially refined heavy oil that has high resistance to oxidation, emulsification and sludging. This assures that lines stay clear and bearings clean for trouble-free performance and minimum wear.

For your enclosed reduction gears, use *Texaco Meropa Lubricant*—noted for its EP stability, its resistance to oxidation, thickening and foaming.

A Texaco Lubrication Engineer will gladly help you select the proper lubricants to assure the most efficient performance from all your equipment. Just call the nearest of the more than 2,000 Texaco Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

TEXACO T REG. T. M.

TEXACO Regal Oils

(HEAVY CIRCULATING OILS)

STEEL

April 16, 1956

Metalworking Outlook

Pay Boosts Climb

Pay boosts granted in the first quarter this year are running well ahead of those last year. Bureau of National Affairs Inc. reports that the median (middlemost) increase was 8.9 cents, compared with 8.8 cents in the fourth and highest quarter last year and 7.9 cents for all of 1955. Some 25 per cent of settlements in the first quarter provided for long-term contracts incorporating provisions for automatic wage increases in future years. New or revised health and welfare insurance figured in almost one-third of settlements, a rate higher than that negotiated in 1955 or in any previous year. Pensions appeared in 14 per cent of settlements, compared with 11 per cent last year. Supplemental Unemployment Benefit plans figured in 2 per cent of contracts, the same frequency as last year.

Employment: 63.1 million

Employment is rising, reversing the seasonal downtrend of January and February. Some 63.1 million had civilian jobs in March, 500,000 above the February level and 2.5 million more than in March a year ago. Look for employment to hold at this rate fairly steadily until next fall. Then, the expected increase in auto production should boost the ranks of jobholders moderately.

Dilemma in Detroit

Watch for a few more auto part suppliers to drop out of business. The melancholy fact is that when auto production slips, independent suppliers' business usually slips even more. Motor Products Corp., one of the latest to drop out, attributes its move to integration policies of auto makers and a price squeeze. Vinco Corp. cites similar reasons for its decision to suspend part production about June 30. Murray Corp. of America gave up making auto bodies in 1954 and switched to appliances and pin-setting machines. In 1953 Briggs Mfg. Co. sold its body-making facilities to Chrysler Corp. and has since concentrated on its plumbing goods business.

Needed: More Capital Sources

Where will expansion capital come from? That's a question worrying executives increasingly. To name just a few industries which will need substantial sums in the next five years: The steel industry must raise $3.5 billion; U.S. electric utilities estimate their capital requirements for the next five years at more than $22.5 billion; Class I railroads contemplate capital expenditures and material purchases totaling nearly $13 billion from 1956 through 1960.

Where Executives Come from

Where do top executives come from? A study by George Frye & Associates, Chicago, reveals that some 20 per cent come from sales activities of

Technical Outlook—p. 91

Market Outlook—p. 127

industry; 20 per cent come from finance; 20 per cent from legal; 20 per cent from family connections; and the remaining 20 per cent from production, technical and miscellaneous areas.

The Fight Against Smog

The smog problem in Los Angeles and the nation's other leading metropolitan centers is receiving the attention of more than 13 major research agencies. Annual cost: Nearly $7 million. The Los Angeles County Air Pollution Control District says it is spending $2.5 million of the total, while $4.5 million is divided among 12 other agencies.

Europe Wants Scrap

You can expect more Europeans to appear in Washington urging that the present rate of scrap exports be continued. Albert Coppe, vice president of the European Community for Coal & Steel, points out that West Europe badly needs metallics and doesn't generate nearly enough scrap. He was in the capital early this month plugging for scrap. He says he received no assurances but was "not unsatisfied" with what he heard.

The Case of Dr. Flick

Allied policies in the late 1940s to decartelize German coal and steel industries are having some unexpected results. Take the case of Dr. Friedrich Flick and associates. They were forced to give up most of their big coal interests in the Ruhr. The Flick group used proceeds of the sale to buy into the French steel combine of Neuves-Maisons-Chatillon, the first German participation in French steel since World War I. Flick has also bought shares in Hainaut-Sambre, Belgian heavy equipment producer—the first German holding in that Belgian industry that has ever taken place. On the other hand, no buyers have been found for the Krupp steel and coal properties. They'll probably fall back into direct Krupp ownership.

European Steel Booms, Too

The American steel industry isn't the only one operating at or near capacity. British consumers today are using steel at a rate officially forecast, only a year ago, for 1958. Even so, 1 million more tons of steel will be available this year than last for the home market. In West Germany 2.2 million net tons of ingots were produced in March, a new high.

Straws in the Wind

Congress has authorized deepening of Great Lakes connecting channels to a uniform depth of 27 ft . . . The Air Force will build a $7.5-million atomic reactor at Dayton, O., to test parts and instruments for an atomic-power airplane; Lockheed Aircraft Corp. and Convair Division of General Dynamics Corp. will work on airframes to house a nuclear engine . . . New construction put in place rose in March to $2.98 billion, equaling the previous March record set in 1955 . . . More than one out of four large urban areas report they will need additional water supplies to meet municipal and industrial growth.

pre-planned results

CMP
RESTRICTED SPECIFICATION
COLD ROLLED STRIP STEEL
boosts production, stops slowdowns, reduces die costs, meets feed and speed requirements of automatic equipment.

In estimating production costs, one of the items a metal fabricator takes into account is the cost of steel. As important as this is, it is sometimes good economics to pay more for steel, but pay less in the end for the fabricated part. The cost of down time on expensive forming equipment, the cost of idle labor, the cost of reprocessing defective parts, may well exceed the cost of the extras built into restricted specification steel, which will eliminate these unplanned-for costs.

CMP restricted specification cold rolled strip steel can be pre-planned to minimize production delays and produce for you the production cost you need. We will welcome the opportunity to explore with you the cost-saving potentials in your manufacturing processes which may be available to you by use of **CMP** restricted specification cold rolled strip steel.

CMP

WHERE YOU CAN GET
SPECIFIC SPECS
FOR
SPECIFIC JOBS

LOW CARBON, ELECTRO ZINC COATED,
HIGH CARBON, TEMPERED SPRING STEEL,
STAINLESS AND ALLOY

THE COLD METAL PRODUCTS CO.

GENERAL OFFICES: YOUNGSTOWN, OHIO
PLANTS: YOUNGTOWN, OHIO & INDIANAPOLIS, IND.
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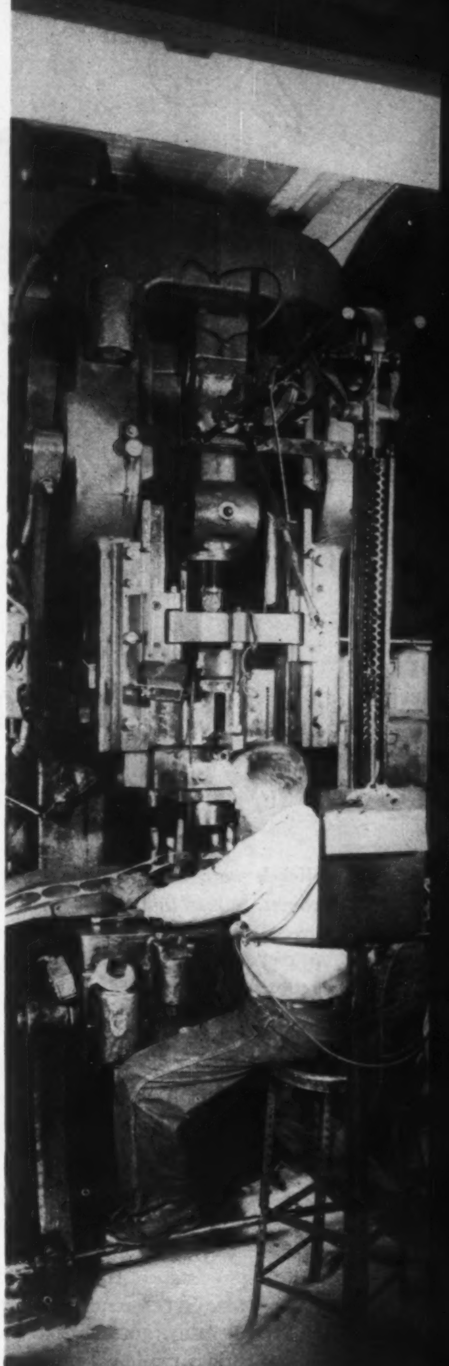
Indianapolis • Detroit • Los Angeles • San Francisco

C·M·P



CMP
STRIP PROVIDES
the precision dimensional and physical qualities that solve many fabrication, cost and performance problems.

How Armco ALUMINIZED STEEL Helped Solve The Case of The Missing Nickels

Nickels were "disappearing" from soft drink vending machines. At least that's what the operators thought. However, investigation revealed that the machines' non-ferrous chain conveyor links were stretching so much customers could get two bottles for only one nickel.

Armco Aluminized Steel was called into the case and solved it. The manufacturer was able to make a strong, non-stretching link with the needed corrosion resistance.

This 2-in-1 metal, sheet steel coated in molten aluminum, offers an unusual combination of properties that may help you solve some of your problems and cut costs too.

Reflects Heat . . . Resists Heat

Aluminized Steel has the strength of steel plus the surface properties of aluminum. It also gives high heat reflectivity and heat resistance. Up to 1250 F the coating on Type 1 Aluminized Steel remains intact.

Type 2 Aluminized Steel has excellent resistance to atmospheric corrosion. Tests show the coating lasts 3 times as long as the coating on standard galvanized steel sheets.

And savings, compared to using aluminum on an equal strength basis, can be as high as 40 to 50% of material cost.

For complete information on how you can use Armco Aluminized Steel to cut production costs and give your products added sales appeal, just fill in and mail the coupon.

ARMCO STEEL CORPORATION
1006 Curtis Street, Middletown, Ohio

Send me information on Armco Aluminized Steel

We manufacture____________________

Name____________________

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ARMCO STEEL CORPORATION
1006 CURTIS STREET, MIDDLETOWN, OHIO

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SHEFFIELD STEEL DIVISION • ARMCO DRAINAGE & METAL PRODUCTS, INC. • THE ARMCO INTERNATIONAL CORPORATION

April 16, 1956

Our Stake in Canada

Canadians say an encyclopedia put out by the communists defines Ontario as "a province bounded on the west by Manitoba, on the north by Hudson Bay, on the east by Quebec, on the south by the Great Lakes, and wholly owned by the U. S."

The propaganda elicits whoops of glee from our good neighbors to the north. Then sober second thought takes over. There is enough truth in the description to make them squirm uncomfortably.

Between 54 and 62 per cent of all dividends paid by Canadian industry and business in the postwar years have gone to foreign investors, predominantly American. If the corner drug and grocery store type of business is excluded, the percentage going to outsiders is much higher.

Forty-seven per cent of manufacturing, 70 per cent of petroleum and 55 per cent of Canadian mining are controlled by foreigners, mostly U. S. citizens. We have $10.9 billion invested in Canadian business, an important stake in a booming economy.

Even more important to U. S. metalworking is the trade between the two countries. Each is the other's most important customer in external trade. The relationship, to an objective observer, is a natural one.

Canada has tremendous natural resources. It can supply minerals which we must have. It supplies most of our nickel and large quantities of iron ore, aluminum, copper, lead, zinc and uranium oxide. We supply Canada with manufactured goods which can be produced more efficiently in this country. Last year, Canada bought $2 billion worth of metalworking products from this country—mostly machinery, transportation equipment and components.

Canada imports three pieces of metalworking equipment for every piece manufactured in Canada. Eighty-five per cent of its imports come from the U. S.

U. S. machine tool builders sell 20 to 25 per cent of their exports in Canada, easily their No. 1 export customer.

Canada is a rich market for our metalworking industry. It will become richer as Canada's industrialization proceeds. Canada, unlike Europe, is not likely to become a serious competitor in manufactured metalworking goods for decades. It's a mutual relationship. The industries of the two countries will continue to supplement each other.

If you are not getting your share of this market, it will pay to investigate. The rewards can be great. But don't forget the story about the encyclopedia from Moscow. It has a moral.

Walter J. Campbell

EDITOR

sheets and strip

every requirement, cut to size, ready to use

When you need sheet and strip steel, cut to size and ready to use—call Ryerson. The separate sheet and strip division at your nearby Ryerson plant can handle practically any and every requirement for these products. And a staff of specialists working with the very latest equipment assures quick delivery of material in excellent condition—accurate to size and carefully strapped and skidded.

You draw on stocks of more than twenty different kinds of sheet steel at Ryerson—hot rolled, pickled and oiled, cold rolled, galvanized, deep drawing and many others. And ton upon ton of coil stock in many gauges are also on hand. To transform these stocks into blanks, straight lengths, coils, etc., efficient Ryerson shearing, slitting and edging equipment and cut-to-length lines, which turn coil steel into flat sheets of any measure are all at your service.

Ryerson sheet and strip specialists stand ready to help you with your selection and fabrication problems. So, when you need sheets and strip—and any other kind of steel—call on the specialists. Call your nearby Ryerson plant.

RYERSON STEEL

In stock: Bars, structurals, plates, sheets, tubing, alloys, stainless, reinforcing, machinery & tools, etc.

JOSEPH T. RYERSON & SON, INC. PLANTS AT: NEW YORK • BOSTON • WALLINGFORD, CONN. • PHILADELPHIA • CHARLOTTE, N. C. • CINCINNATI CLEVELAND • DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO • SPOKANE • SEATTLE

Caterpillar Tractor Co.

High demand for equipment, materials is coming because . . .

Road Program Ready To Roll

"WE'VE GOT to have more highways, government program or not—so we're making plans to build them," say roadbuilders and equipment producers.

Estimates put the nation's road needs over the next 30 years at $216 billion (see table). That averages out to about $7 billion a year, compared with an average of $3.5 billion over the last four years.

Under the impetus of such a program, annual demand for roadbuilding materials (see table on page 52) would more than double (triple for some items) because new highways will be thicker, wider and tougher to carry a vehicular population that is growing explosively: 81.7 million by 1966, 100 million by 1976, probably more than double today's 63 million by 1985.

Muscles—As recently as last year it was estimated that $1-million worth of roadbuilding took 450 tons of steel. Now the estimate is up to 500 tons. On the proposed 40,000-mile, $27-billion interstate highway system, steel requirements may be as high as 850 tons per $1 million.

Allowing for costs of right of way, the interstate system alone figures to be a market for about 17 million tons of steel over a 13-year construction period.

If proposals before Congress are approved, highway spending would rise to about $9 billion a year (including engineering and costs for right of way), almost double the 1955 volume of $4.6 billion.

Sales — About equipment, F. Salditt, vice president, Harnischfeger Corp., predicts: "The construction equipment industry could expect a sales increase of 15 to 20 per cent in the first year when the construction program should rise to $8.5 billion."

That also means expanded demand for metals and components. Take Caterpillar's D8 tractor: Construction requires 8000 lb of steel plate, 11,500 lb of bars, 4000 lb of semifinished steel, 4000 lb of steel castings. But that's just a start: Total weight of the machine without engine is 34,955 lb. A D8 with direct drive weighs 39,060 lb (dry weight), with torque converter, 39,925 lb. Newer D9 hits 56,000 lb.

Boost—Even if a stepped-up program should bog down in Congress, the outlook for roadbuilding and equipment is still pretty good. Last fall the Commerce department estimated net highway construction in 1956 would be $4.6 billion, compared with 1955's net of $4 billion. Industry sources now say the 1956 net will be closer to $5 billion. With engineering and right-of-way costs included, the total would approach $6 billion.

Comments H. T. Reishus, vice president, International Harvester Co., second largest builder of construction equipment: "For the next 24 to 26 months we have a multimillion-dollar expansion program going. Even if the federal highway program gets the green light, our plans probably won't change. We've considered that program along with all the forces of the market and feel we're growing at the best rate. Likewise, if

Highways Are Built on Steel

(thousands of tons needed according to annual outlays for roads)

	If $4 Billion*	If $8 Billion	If $10 Billion
Steel (total—structural, reinforcing, metal pipe)	1,632	3,671	4,691
Structural steel	816	1,930	2,487
Wide flange shapes	368	870	1,121
Standard shapes	176	411	529
Bearing piles	80	190	245
Sheet piles	32	79	103
Plate	160	380	489
Reinforcing steel	680	1,527	1,951
Pavement	99	222	283
Bar	581	1,305	1,668
Corrugated Metal pipe	136	214	253
Reinforced concrete culvert pipe	2,334	4,384	5,409
Wire mesh reinforcement for pipe	53	99	122

Source: American Road Builders' Association
*Expenditures for 1954

the program fails to get passed, we probably won't be reducing our schedule."

For other companies a highway program will mean stepped-up capital outlays. J. R. Steelman, president, Koehring Co., Milwaukee, says: "Adoption of a highway program will accelerate and probably enlarge our present plans for plant and equipment expenditures. Assuming that the highway bill will be substantially in the form of the Fallon bill if it is passed this year, we'd estimate our sales of equipment used primarily for highway work would increase somewhere between 15 and 20 per cent."

"A great deal," observes E. H. Holt, vice president, Barber-Greene Co., Aurora, Ill., "depends on whether Congress sets up an adequate long-range program rather than merely increasing the amount of funds to be available in the next 12 to 18 months. Then contractors could be sure of a sustained level of operation and justify equipment purchases that they might not make if only a short-range program is contemplated."

Aid—Some easing may be ahead in the materials picture. Several steel producers checked by STEEL definitely say that the worst is over in many kinds of plates and structurals, though it will still be sometime before you can walk down to the corner mill or warehouse and pick all you want off the shelf. New capacity is helping; more is due.

Confidence—In the main, the entire construction industry is confident it can handle a doubled or, given a little time, even a tripled highway program. American Road Builders' Association task forces—comprised of contractors, engineers, equipment builders and material suppliers—recently told a House subcommittee on roads: "In 1955 highway contractors operated at 53 per cent of capacity; they could successfully undertake a $7.8-billion highway construction program with practically no expansion of present organizations and equipment.

"By the second year it is estimated that present capacity could be expanded to take care of a $10-billion program; in three years a $12-billion level could be readily sustained on an annual basis."

"The value of the federal program is its longer range of planning. It would be a continuous program giving producers time to plan ahead and to know something about their future market," states C. J. Haring, director, general equipment sales, Westinghouse Air Brake Co., Pittsburgh.

Status—Everyone from President Eisenhower on down to the pokiest Sunday driver agrees an expanded federal program is needed. It's pretty well settled that any such program will be pay-as-you-build, with most of the money coming from increased taxes on highway users.

Highway Users—Those who will be touched hardest, such as truckers, and those who feel the truckers should pay even more of the cost, are willing to settle for something close to a combination of the Fallon bill (which would authorize a road program) and the Boggs bill (which would raise the money to pay for it). Both are being maneuvered through House committees.

Size — Approval would bring about a 13-year program with fed-

How Highway Needs Shape Up:

(in billions)

	1955-1964*	1965-1984†	TOTAL 1955-1984
Interstate System	$23.9	$ 9.7	$33.6
Other federal-aid primary	29.9	36.0	65.9
Federal-aid secondary	14.9	20.8	35.7
Other state highways	17.1	7.0	24.1
Other roads and streets	15.6	40.9	56.5
Totals	$101.4	$114.4	$215.8

Sources: *Clay Committee report. †Bureau of Public Roads. Costs include right of way eral expenditures of about $37.35 billion. State matching funds for the interstate and other federal-aid highways would come to $14.16 billion. Total: About $51.5 billion.

Pitfalls — Controversy in the House or Senate on any of these might stymie action:

1. A provision for applying the Davis-Bacon Act, permitting the federal government to determine prevailing wages paid on construction work for the interstate system.
2. A provision that the federal government pay 50 per cent of the cost of relocating public utility lines along the interstate system.
3. A provision that the commerce secretary study and report to Congress in January, 1958, on extending credits to states for existing free and toll roads located on the interstate system. Such credit was provided in the original Fallon bill, but the roads subcommittee changed it. Several state delegations have plans already made to put the original provision back in.

Increasing taxes in an election year isn't favored much either.

Change—Still, the outlook has brightened in the last few weeks, compared with gloomy prospects voiced a month ago. Politics are closely tied in: Neither party relishes being accused of depriving the nation of sorely needed roads; each side wants something big and tangible for campaign ammunition. Passage of the road bill could be it.

• An extra copy of this article is available until supply is exhausted. Write Editorial Service, Steel, Penton Bldg., Cleveland 13, O.

"PEOPLE are always wanting to dig up the earth's surface, burrow under it or drag things across its rough parts. And we're always designing some new machine to do some or all of those things."

That's the way Harmon S. Eberhard, president of Caterpillar Tractor Co., sums up his confidence in the continuing growth of the earthmoving equipment business and his belief that research and engineering will help his company maintain its number one position in that industry.

Waiting—The entire industry is waiting for action in Washington on a federal highway program. "There's no doubt that our highways should be substantially improved," says Mr. Eberhard. "While there is disagreement concerning the method of financing such a program, I don't believe that problem will be allowed to deprive the public of badly needed, safe highways for our increasing millions of cars and trucks."

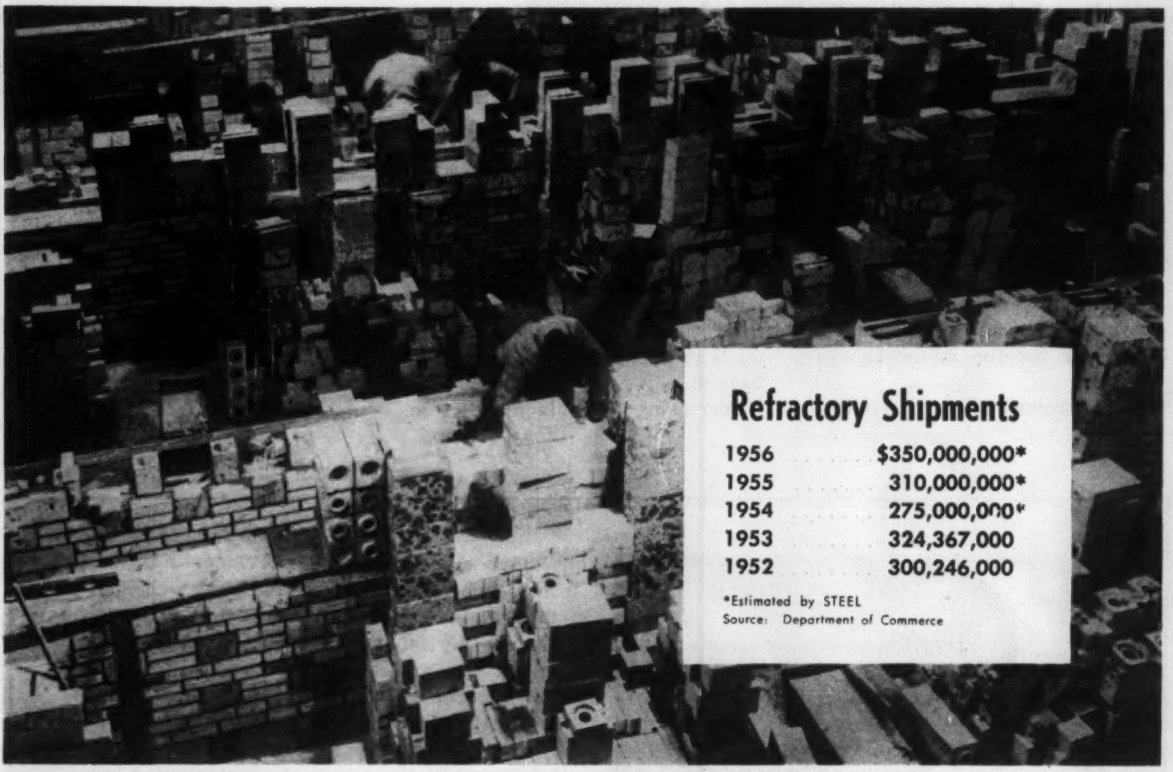
Since 1946, Caterpillar Tractor has grown from two plants to nine, including subsidiaries in England, Brazil and Australia. Sales in 1955 topped the $500-million mark for the first time in the firm's history and never before was so much engineering and research translated into product realities in a single year.

Background—Mr. Eberhard is no newcomer to either his company or the earthmoving industry. At 16 he became a draftsman for Holt Mfg. Co., Stockton, Calif. He enlisted in the Army at 18, was assigned to the Corps of Engineers and helped build Army camp roads with horse-drawn scrapers. After World War I, he returned to Holt, which in 1925 merged with Best Tractor Co., Peoria, Ill., to form Caterpillar Tractor.

He became assistant general chief engineer in 1929 at the company's San Leandro, Calif., plant and chief engineer in charge of research and engineering in 1931. Two years later he transferred to Peoria as chief engineer. Top rungs in his climb: Vice president and a director in 1942, executive vice president in 1950, president in 1954.

Future—What's ahead for Caterpillar Tractor? More of the same, the 56-year-old president emphasizes. Sales target for this year is $600 million plus. A $190-million expansion program has been mapped out for the next four years.

"We must accelerate the work of our research laboratories if we are to provide adequate tools for doing the tremendous jobs that lie ahead," says Mr. Eberhard. "The needs for the future are tremendous; we must have the creativeness and vision to plan for that future. Our kind of machinery is needed in increasing quantities everywhere in the world to do the work which must necessarily be done to keep pace with natural population growth."



Refractory Shipments

1956	$350,000,000*
1955	310,000,000*
1954	275,000,000*
1953	324,367,000
1952	300,246,000

*Estimated by STEEL
Source: Department of Commerce

Steelways

Refractory Makers Expand

The industry is in good shape as it prepares to back up steel's three-year, 15-million-ton expansion program. Deliveries of most refractory materials are prompt

REFRACTORY materials won't be a stumbling block in the steel industry's expansion plans. The industry is improving its production methods and modernizing its equipment.

Companies expanding their facilities include: Kaiser Aluminum & Chemical Corp.; Harbison-Walker Refractories Co.; General Refractories Co.; Basic Inc.; Charles Taylor Sons Co.; Babcock & Wilcox Co.; Mexico Refractories Co.; and Carborundum Co.

Besides supplying the steel industry, refractory manufacturers report their sales for nonsteel applications are rising. A 15-percent increase in sales this year is predicted (see table).

More Use — Sales patterns of most refractory makers are the result of years of service and product testing; it is rare for a technical development to bring about a sudden sales spurt. Notable, however, are: Increased use of basic brick in open-hearth roofs, end walls and checkers; improved bottom materials; superduty semisilica brick for blast furnace stoves and heating furnaces; and more gunning of repair materials in open hearths and electric furnaces.

Deliveries are generally prompt: special shapes may take six to eight weeks; hand molded may require eight to ten weeks. Superrefractories take longer, too.

High Demand — Refractories in greatest demand are heavy-duty fire-clay, ladle brick, intermediate duty, superduty and high alumina products. Specialty items like plastic firebrick and castable refractories are replacing firebrick in many installations.

Use of carbon as a blast furnace lining material continues to gain acceptance. It virtually eliminates hearth breakouts and provides longer life, experts say.

New Types — Tar-bonded basic shapes are being tested in oxygen vessels. Now in routine use in Canada, this type has been used many years in Europe. Also new is superduty stiff mud de-aired firebrick, which features great hardness and density.

Injury Rates Go Up

Preliminary figures of the Bureau of Labor Statistics show the injury-frequency rate for manufacturing in the last quarter of 1955 was 4 per cent over 1954's fourth quarter.

The average for 1955 was 12.1 disabling injuries per million man-hours worked compared with a rate of 11.9 in 1954.

The steel industry's rate in 1955 was 4.9. In 1954 it was 4.3.

Railroads Go Lightweight

Passenger car orders this year are up slightly from 1955's. Railroaders hope light, low-cost trains will offset loss of passengers to the air lines and private autos

LIGHTWEIGHT, low-cost passenger trains will help railroads cut back their annual deficit of $700 million on passenger operations.

The Talgo, made by ACF Industries Inc., is in service on the Rock Island (see photo), and other new trains are under construction for the New Haven and the Boston & Maine.

Experimental — General Motors Corp.'s Aerotrain is in experimental service on the Pennsylvania. Another soon will be operating for the New York Central. Pullman-Standard Car Mfg. Co.'s Train X is scheduled shortly for delivery to the NYC; the New Haven also has an X on order. Budd Co. is building a Tubular train for the Pennsy and a yet unnamed variety for the New Haven.

These low-slung trains, with high average speeds, large seating capacities and modern appointments, are designed to attract more passengers at substantially lower costs to the carriers.

Inroads—The railroads hope to check the competition of air lines and private autos. Last year the air lines flew 21.4 billion passenger miles, while railroads accounted for 23.7 billion passenger miles.

Fuel consumption may be cut 50 per cent with these trains. Although the exterior of only one (the X) is aluminum, the use of stainless steel and aluminum has cut per seat weight to 700 lb in at least one instance—a weight reduction of two-thirds.

Economies — Construction costs are down, too. The Aerotrain cost between $1500 and $1700 per seat, compared with the conventional $2800. Based on orders for 20 trains, Pullman-Standard says the X costs $1650 per seat.

The impact of these new trains will be light this year; in fact, they may have the effect of slowing down passenger car buying until their performance can be fully appraised. More advanced designs are yet to come. Carriers are more disposed to spend money on more immediately profitable equipment like freight cars and communications equipment. (Large expenditures for motive power have about run their course.)

Name Trains — Conventional trains dedicated to luxury and speed will hold their own for a long time. Five Hi-Level trains are being built by Budd for the Santa Fe; Budd also is working on two Denver Zephyrs with Siesta coach sleepers for the Burlington.

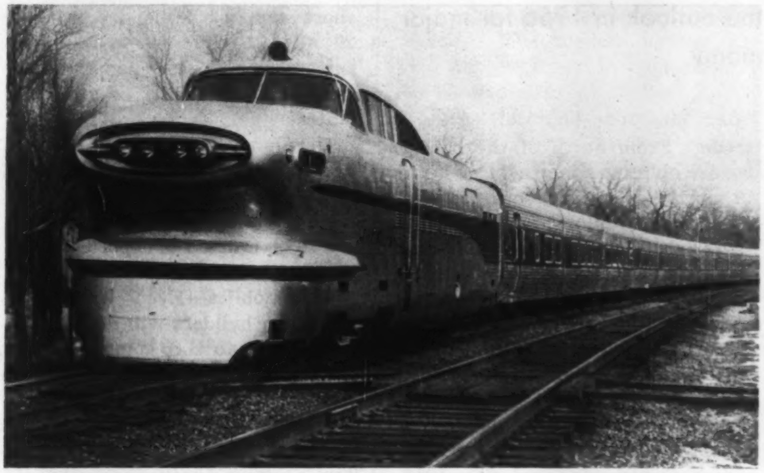
The adoption of the new trains for overnight travel, however, is not too far off, say some experts. The Rock Island reportedly is thinking about the purchase of a lightweight train for its 1300-mile run from Minneapolis to Houston.

Over 42 per cent of the 37,600 passenger cars owned by Class I railroads are over 30 years old; Some 25 per cent are 26 to 30 years old. Plenty of money is being spent on the modernization of these cars. The Pennsy reports 70 per cent of its 2535 through-service passenger cars are 25 years old; half of them are new, or already modernized.

Tempo Up—During the first two months of 1956, orders for 81 passenger cars were placed. That's a little ahead of last year's pace, when 378 were placed all year. The record shows orders for 1078 cars last year, including 700 refrigerator express cars for the Railway Express Co. They are classed as passenger cars.

Backlogs totaled 337 passenger cars, plus 500 refrigerator cars, as of Mar. 1.

Two reasons for a spurt in car orders: 1. New car purchases fall well short of retirements. 2. Currently, the railroads are appealing for higher passenger fares. Improved rolling stock and schedules will be needed to attract more customers.



The Rock Island's Jet Rocket

This silver and maroon speedster flashes along the Illinois river between Chicago and Peoria, Ill. The Jet Rocket is the first lightweight train of its kind to operate in revenue service

Air Lines Get Tax Write-Offs

Air transportation facilities figured heavily in projects approved for fast tax write-offs by the Office of Defense Mobilization from Mar. 8 through Mar. 21. Thirteen projects (certified total, $509,935,409) were approved by the ODM for seven firms: Capital Airlines Inc.; Delta Air Lines Inc.; Eastern Air Lines Inc.; United Air Lines Inc.; American Air Lines Inc.; Northwest Air Lines Inc.; and Western Air Lines Inc.

Total certifications during the period amounted to $598.6 million.

In Canada, the Boomiest Boom

(In Billions of Dollars)

	1946	1955	1956*
Capital Expenditures	1.7	6.2	7.5
Gross National Product	12.0	26.6	29.0
Manufacturing Production	8.0	19.6	21.5

*Estimates

A Giant Waking Up

Canadian industry is growing at a rate unrivaled anywhere else in the Free World. Here's the outlook in 1956 for major segments of the Dominion's economy

CANADIANS will tell you their economy is growing faster than any in history. While superlatives often are difficult to substantiate, they can cite some impressive figures.

In nine of the ten postwar years, Canada's economy has set new records in income and employment. Last year's records will fall in 1956. New highs will be established in capital expenditures, gross national product, manufacturing product and per capita earnings.

Important to U.S.—Canada and the U.S. are each other's most important customer in international trade. From north of the border we are obtaining increasingly large proportions of iron ore, copper, lead, zinc, uranium and other raw materials. Canada is our most important outlet for manufactured metalworking products.

The relationship of the two economies is close. In Toronto, Ottawa and Montreal, economists are fond of saying: "When the U.S. sneezes, Canada catches double pneumonia." The only postwar year in which Canada faltered was 1954, the year of stateside readjustment.

Spending—Capital expenditures in Canada this year are scheduled to go up 21 per cent over 1955's, which, in turn, were up 11 per cent from 1954's. Present estimates are for capital spending of $7.5 billion. If maintenance and modernization are included, the figure exceeds $10 billion.

Capital expenditures for manufacturing will go up 39 per cent to $1.3 billion. Utility spending, aided by St. Lawrence Seaway developments, will increase 52 per cent to $1.6 billion.

Men, Materials—Only obstacle to making those forecasts come true, say Canadian industrialists and economists, is a possible shortage of men, materials and machines.

Industry by industry, the editors find this outlook for 1956:

Aluminum — At least 112,000 tons of capacity will be added. Ingot production in 1956 will be up 5 per cent.

Copper — Production will be pressed to the limit, with world supply short.

Lead—Year will be good. Demand for exports and the Canadian auto industry will be strong.

Zinc—Demand good from auto and construction industries.

Iron Ore—Brilliant prospects for this and years to come. Last year's shipments more than doubled the previous year's.

Nickel—Shipments will be limited only by capacity. Operations will exceed 100 per cent.

Gold—Sick. Too much price stability.

Steel—Will continue in critically short supply. Mills are working 20 and 21 shifts a week. Consumers can't get enough either from domestic mills or from the states.

Uranium—This is the real Cinderella of Canada. Output of uranium oxide is expected to increase tenfold from 1955 to 1957. By 1958, Canada is expected to become the No. 1 producer.

Automobiles—Even with 1955. Canadian builders will do relatively better than U.S. companies.

Construction — Excellent. Manpower and materials will be short.

Farm Machinery—Will continue depressed, as it has been for several years.

Railroad Equipment—Feast or famine industry. This year, a feast.

Power—Biggest year by far.

Capital Goods—Prospects good,

although domestic makers face rough foreign competition. Canada imports three times as many machine tools as are purchased from Canadian builders.

Blood Pressure—Sums up J. R. Petrie, economist for Jones Heward & Co., Montreal: "Our economy is in wonderful shape, except for a tendency to high blood pressure. With sensible financial and governmental policies, we'll avoid excessive inflation and continue our long-term growth."

Better Stainless

Eastern Stainless Steel Corp. uses a new melting process to eliminate stringers

INDUCTION FURNACES are being used by Eastern Stainless Steel to make special, high-temperature alloys.

The Baltimore company makes Uniloy 19-9DL, Uniloy 19-9DX, A-286 and 321SW from selected raw materials because there can be no refining in induction furnaces.

During melting, induction currents give continuous magnetic stirring. Oxides and other foreign substances float to the top of the bath where they are removed by the operator.

No Ladles—After the melt is brought to the right temperature for deoxidizing and pouring, the steel is poured directly from the furnace to the mold.

A special, high-temperature slag is put in the mold before pouring. As metal flows through the slag (its temperature is about 2800° F, close to that of steel), a washing action removes contaminants.

Protection — The slag prevents air oxidation by forming a protective coating over the surface of the molten steel as it rises in the mold.

The hot slag also slows down the rate of solidification. This allows any remaining low-density contaminants to locate in the liquid phase and float to the top center of the ingot where they can be eliminated.

All stainless steels can be made free of stringer-type inclusions with the process.

Trouble Points for Small Business

1. Limited capital is stretched too far
2. Poor methods of handling credit
3. Too much slow-moving and dead stock
4. No knowledge of the market
5. Poor record keeping
6. No time to analyze trends
7. Lack of outside advice
8. Little knowledge of competition
9. No training in management techniques
10. No knowledge of how to get additional funds

Small Business: Big Risk

The opportunities for small businesses to get bigger and last longer aren't what they should be, says one expert. The problem is to make one man do the job of a whole team

CHANCES are that only one of five small businesses will attain the age of ten years, says Prof. Harold B. Wess of American University. The median age of the 4.2 million firms in this country is seven years.

Why the high mortality rate? Professor Wess cites ten reasons (see check list), and adds: "Small businesses characteristically have insufficient working capital, and cannot afford to tie up this capital for any long time on improvements in plant and equipment."

Investment — Dependency on plowed-back earnings for working capital is the major concern of any small business. Without access to capital markets and to investors' savings through the issuance of stocks and bonds, the small businessman must turn to commercial or bank credit—which often is not available when most needed.

And earnings, says Professor Wess, are not favored by the present tax structure.

Not all businesses are liquidated because they are unprofitable, but half the liquidations and one-fourth the transfers are made to avoid or minimize loss, a 1946 study shows.

Economical—Personalized service is the outstanding quality of the small business, according to Professor Wess. A small business can economically perform certain services not suitable for big business to handle. Seventy-five per cent have fewer than four paid employees.

The future of small businessmen depends on their ability to act in many capacities: As buyers, sellers, financiers, controllers and record keepers. Business schools, concludes Professor Wess, must develop courses designed for the future small businessman.

More Defense Funds Asked

Chances of a tax cut dim as the President seeks to boost the missile program and add more long-range heavy bombers. Congress will probably O. K. his requests

AN ADDITIONAL $547 million has been asked for the Defense department by President Eisenhower. Much of it will wind up in the hands of metalworking.

Biggest chunk of the money would be earmarked for the Air Force, $248.5 million for B-52 bombers and $128 million for military construction (Strategic Air Command bases and early warning radar stations).

Missiles—The Navy would get $65.6 million for radar stations and the conversion of some ships into missile carriers; the Army, $55 million for radar and reserve forces.

An additional $50 million would go into the Defense department's emergency fund which supplements regular appropriations for research and development. Reason: To take care of any needs that may pop up in the ballistics missile program.

Still Balanced — So the President's precariously balanced budget moves toward red ink. But if budget planners are right, it won't quite get there. They say that while the appropriation asked for is $547 million, just $400 million of that will be spent this year (and that was the estimated budget surplus for fiscal 1957).

There's a good chance this defense money will be put up by Congress since there has been considerable harping there about an inadequate defense program, especially for heavy bombers and missiles.

So chances for a tax cut continue to dim.

Missile Chief Heckled

Eger V. Murphree, Defense Secretary Wilson's choice to head up a crash missile development program, has already irked some Congressmen.

The gripe is that Mr. Murphree is a WOC and shouldn't be in a policy making position. The current role of WOCs, especially those in Defense Production Act jobs, is supposedly limited to giving advice. But Secretary Wilson has authority to have up to ten WOCs in policy making positions, so there's no reason why Mr. Murphree should be squeezed out.

Watching Watches

The Office of Defense Mobilization is taking a look at the watch and clock industry to see if imports are threatening national security. Domestic firms contend that imports cause them to lose business, with a consequent loss to the nation of skilled workers and production facilities.

Meet Terry B. Martin: Now serving as director, electrical equipment division, Business & Defense Services Administration, he's on leave for six months from Square D Co., Industrial Controller Division, Milwaukee. He has been in the electric motor control industry since 1922. Other experience includes electric motors and internal combustion engines.

Watch importers say boosted tariff protection would only result in higher watch prices, contribute nothing to national security.

SUB and Taxes

Supplementary Unemployment Benefits under the so-called glass plan have been classified by the Internal Revenue Service as "gross income to the employee on whose behalf they are made and must be reported as such on federal income tax returns."

That amount would also come under tax withholding, the Federal Insurance Contributions Act and the Federal Unemployment Tax Act. Rulings on those tax factors as they affect Ford-type plan are pending.

Here and There

The Office of Defense Mobilization's machine tool leasing program (started last August to aid flood-hit plants in the Northeast) has been put on stand-by, but can be reactivated if needed. Plants producing defense items have top call on such tools.

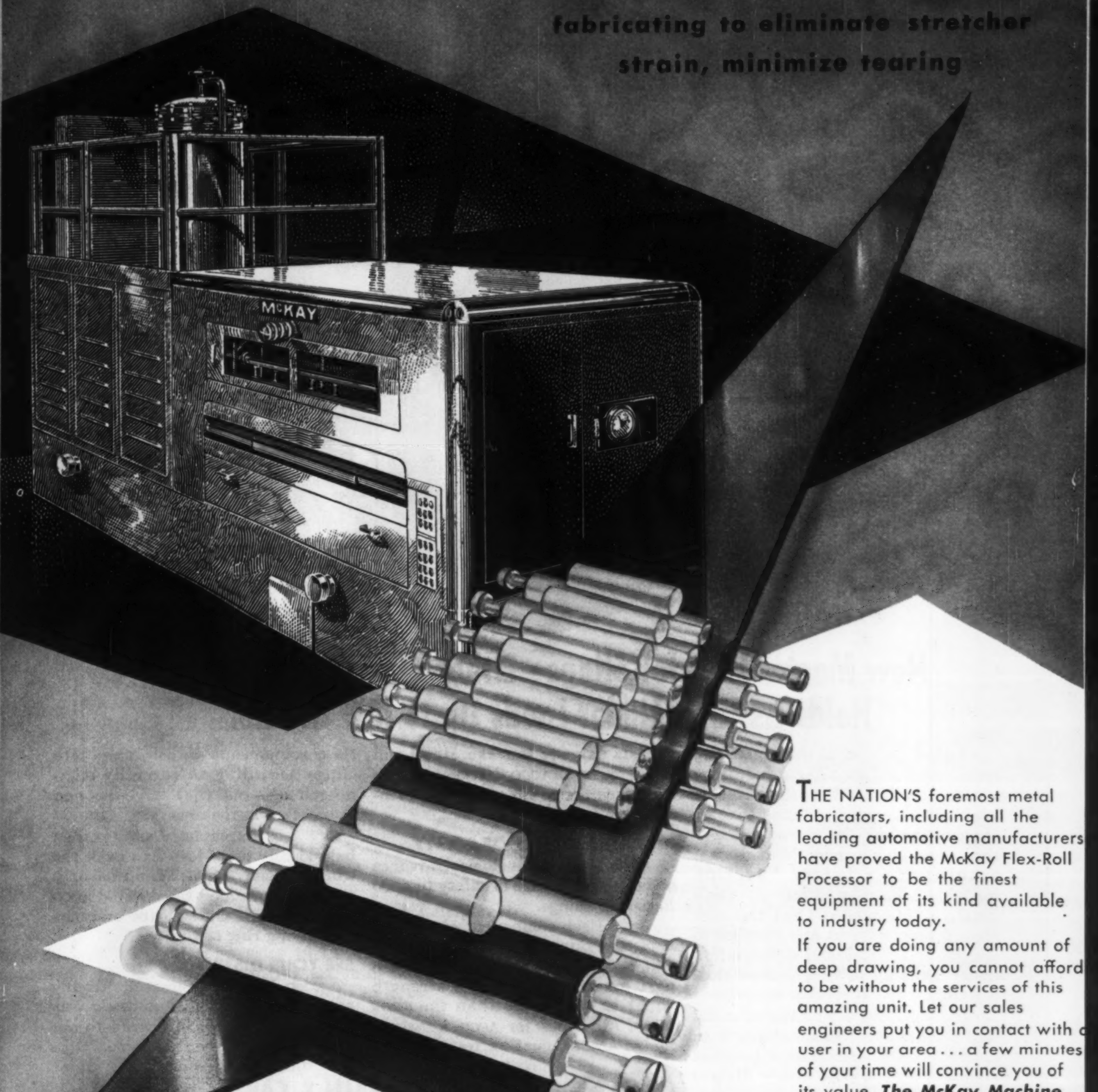
Small businessmen wishing to sell to the Army can get a list of that service's buying officers by cities and states, plus the names of 360 small business specialists. The Army let $665 million worth of contracts to small business over the last six months.

Five small firms in the Detroit area have formed a production pool for fundamental and applied research and development in electronics, chemistry, plastics, metallurgy and nuclear energy. The name: American Scientific Technical Research Organization Inc.

To get 7000 to 8000° F, the Air Force is going to the sun for heat. It'll build a huge solar furnace near Alamogordo, N. Mex. Uses: High temperature research and testing of materials and weapons components. It will duplicate, as nearly as possible, the thermal ranges of nuclear weapons and test high temperature chemical reactions.

McKay's Flex-Roll Processor

Conditions steel prior to fabricating to eliminate stretcher strain, minimize tearing



THE NATION'S foremost metal fabricators, including all the leading automotive manufacturers have proved the McKay Flex-Roll Processor to be the finest equipment of its kind available to industry today.

If you are doing any amount of deep drawing, you cannot afford to be without the services of this amazing unit. Let our sales engineers put you in contact with a user in your area . . . a few minutes of your time will convince you of its value. ***The McKay Machine Company, Youngstown, Ohio.***

McK

SETTING THE STANDARDS OF QUALITY IN METAL WORKING MACHINES FOR TWO GENERATIONS

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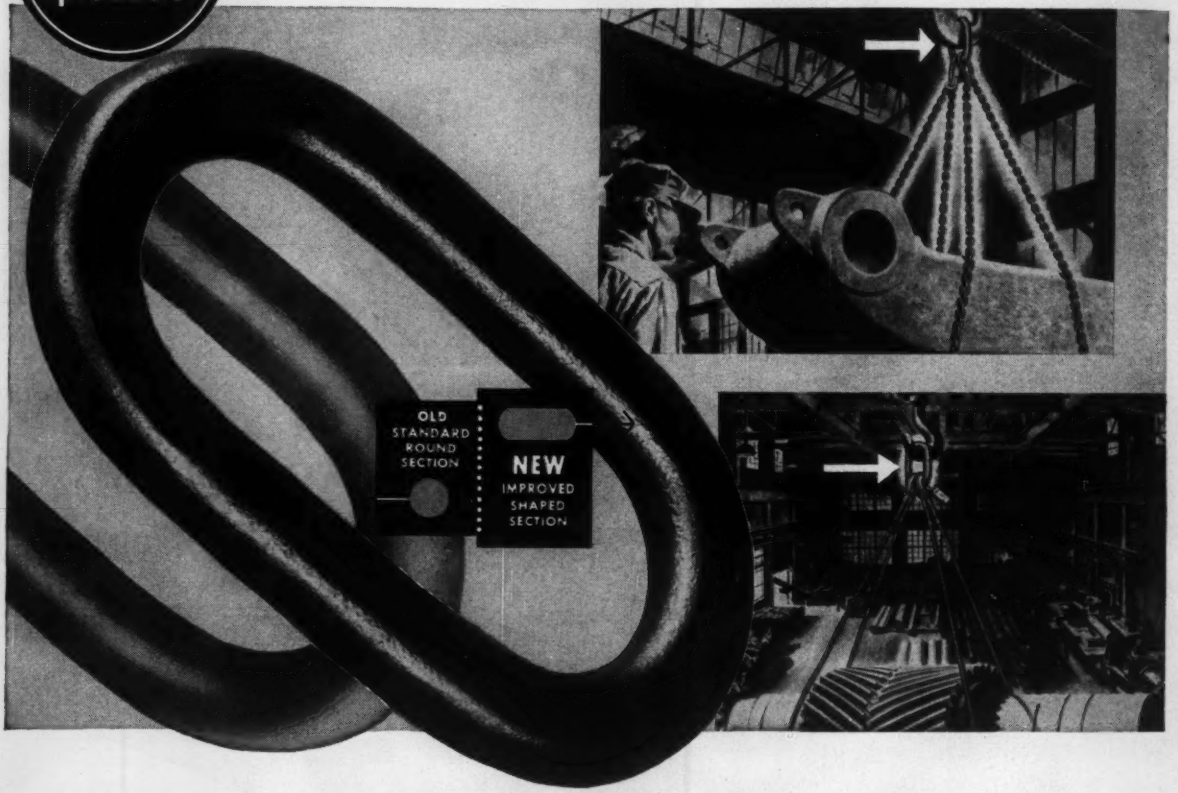
ACCO
products

ACCO Registered* Slings-Wire Rope & Chain

THE STANDARD OF EFFICIENCY AND SAFETY



New Master Link for Slings—Either Chain or Wire Rope—Holds Its Form Under Loads Up to 18% Greater

• Latest product of the continuing research behind ACCO *Registered* Slings is this new Shaped Section Master Link. ACCO's engineers found that by shaping the link—as shown above—they could give it more "dimensional stability"—a better "section modulus." Translated into layman's English this means that the new shaped link, without any increase in weight, will withstand deformation under loads up to 18% greater than a standard round section link will.

Just as shaping a quantity of metal into a structural I-Beam allows it to handle greater loads than it could as a solid beam, so does ACCO's Shaped Section Master Link give better performance under greater loads than a link with a round section.

The new shaped link is smoother and provides a greater factor of safety. It is a better and safer link. It costs us more to make. But it will be offered on all ACCO *Registered* Slings—both wire rope and chain—at no increase in price.

AN EXTRA BONUS OF SAFETY

This latest technological advance adds an extra bonus of safety to ACCO *Registered* Slings.

Each component of an ACCO *Registered* Sling is made from the best materials procurable for its use. Each part must prove to have strength equal to or greater than the sling body. All hooks for ACCO *Registered* Slings are Magnaflux tested. Then these components are assembled into slings according to carefully engineered designs that have proved themselves in rigorous field tests.

The completed sling is then individually proof-tested to twice the working load limit. Then and only then, is it awarded the coveted ACCO Registration Certificate and the identifying ring or tag.

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ACCO *Registered* Slings are readily available from a distributor near you. If you don't know him write to our Bridgeport office for his name.

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ACCO

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San Francisco, Wilkes-Barre, Pa., York, Pa.
In Canada: Dominion Chain Co., Ltd., Niagara Falls, Ont.

Better Value

Management at Work

Servel's John Morrill: Corporate Doctor

PULLING production out of a hole and putting a company in the black are familiar chores for John R. Morrill. The new vice president and general manager of Servel Inc. uses staff competition to get maximum results.

Each Saturday morning he discusses current problems with his assistants and outlines plans. "The meetings are a sounding board for new ideas and problem solving," he says. Manufacturing, quality control and sales personnel vie for top honors.

Power House—In the Commercial Refrigeration Division, Mr. Morrill is responsible for everything from sales to the man who sweeps the floor. "Hard hitting action is the only way to get results," is the motto he lives by.

Department heads have free rein to make changes and assume responsibility. Progress is measured by costs, quality and production.

Results—Since last November Mr. Morrill's division has come a long way on the recovery road—after sustaining losses for three years in a row. His hitch in the corporate belt cut labor costs in his division by nearly 40 per cent. The first quarterly report for 1956 indicates his contribution: 80 per cent closer to the black.

"And that's our normal, slack season," he points out.

Choice—Duncan Menzies, Servel's president, picked John Morrill because rebuilding a company is right up his alley. His first job was on the assembly line at Cleveland's Lincoln Electric Co. He ended up as assistant vice president. Then, in partnership with R. H. Davies (now vice president of Clark Equipment Co., Cleveland), he helped rebuild the Baker Raulang Co., Cleveland—it took only two years to put it in the black. Sale of the company in 1952 to a New York syndicate resulted in his taking Horace Greeley's advice. For a time he was part owner of Gibson Welding Supplies, Spokane, Wash.

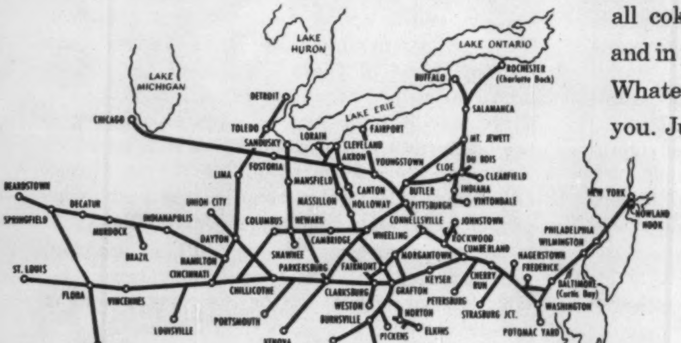
Sport—John Morrill's recreational interests are as varied as his managerial experience. His first love is skiing, and he manages an annual *schuss* or two at Sun Valley, Idaho. Next in line are tennis, hunting, golf and flying (until recently, he owned his own plane).

A Stanford engineer, complete with Phi Beta Kappa and Tau Beta Pi keys, he did a year's work at its Graduate School of Business.

His father is president of the University of Minnesota.

Which comes first—
COAL or STEEL?

● We give up . . . Without coal, the vital steel industry of today could not exist. Without steel, the enormous tonnage of coal needed by the steel industry could not be produced or delivered. Here is another example of the interdependence of two basic industries!


LAKE MICHIGAN
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LAKE ERIE
CHICAGO
DETROIT
TOLEDO
SANDUSKY
LORAIN
FAIRPORT
CLEVELAND
AKRON
YOUNGSTOWN
BUFFALO
ROCHESTER (Charlotte Dock)
SALAMANCA
MT. JEWETT
DU BOIS
CLOE
CLEARFIELD
INDIANA
VINTONDALE
BUTLER
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POTOMAC YARD
PHILADELPHIA
WILMINGTON
NEW YORK
HOWLAND HOOK

We can report *this*, however: The mines in Baltimore & Ohio territory are prepared and equipped to go right along with the steel industry in its expansion program. Too, there are millions of tons of untapped reserves of coking coals available for development.

These coals are available in varieties for all coking needs. They are easily accessible, and in plentiful supply for long-range planning. Whatever your requirements, let us advise you. Just *ask our man!*

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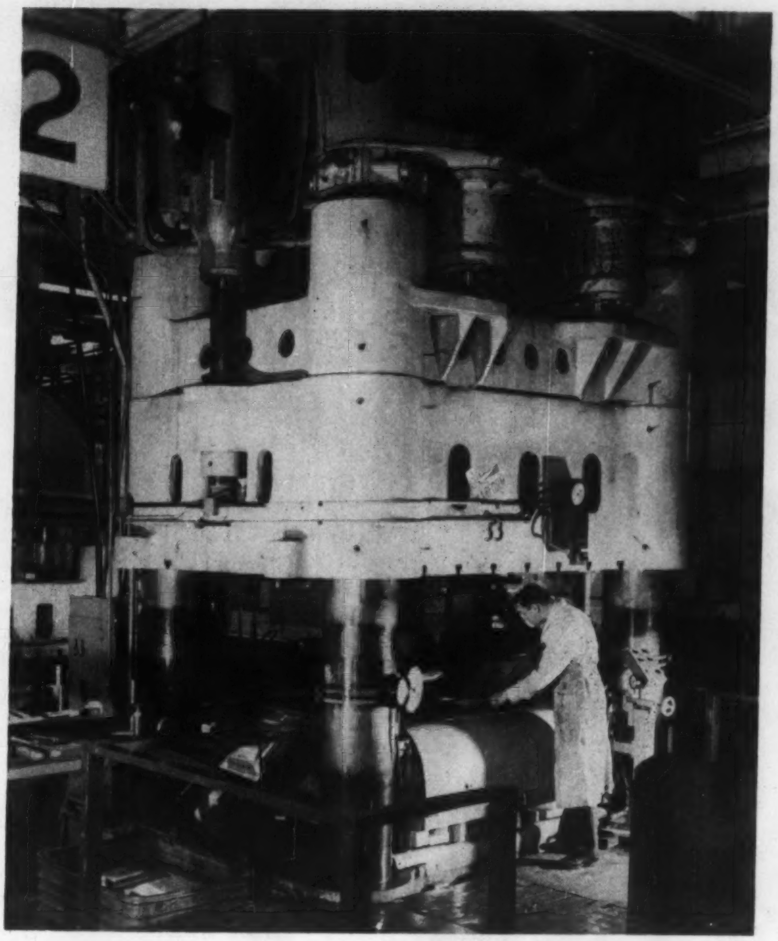


A 3500-ton press at the Glenn L. Martin Co., Baltimore

Presses Show Progress

Auto makers are establishing replacement programs. More fabricators are using presses. 1956 will be at least as good a year for press producers as 1955

NEW ORDERS for mechanical and hydraulic presses have producers smiling.

Department of Commerce statistics show that new orders for forming and shaping machines were up 129 per cent in 1955 ($378.1 million, compared with $164.8 million in 1954). New orders for all metalworking machines increased 88 per cent from 1954 to 1955.

Manufacturers of forming and shaping machines have a busy year ahead of them. They had a 16-month backlog ($319.5 million in unfilled orders) at the end of last year.

Mostly Mechanical — Auto makers hold first place as customers for mechanical presses. Other major users include appliance, lighting fixture and office furniture makers. Mechanical presses accounted for 53 per cent of forming and shaping machine shipments in 1955.

Niagara Machine & Tool Works, Buffalo, reports: "The automobile industry has increased its buying of mechanical presses sharply in the last six months." Auto expansion and decentralization programs are boosting demand.

Some auto makers are establishing replacement programs which guarantee periodic investment in new presses. There's growing realization that fabricators with outmoded presses can't compete.

Modern Design — Improvements in the design, speed and lubrication systems of mechanical presses are important. With the operating mechanism in the lower portion of the press below floor level, maintenance won't interfere with plant activities. In the newest presses, controls are confined within the framework for greater protection and lower maintenance costs. Automatic oil pressure lubricating systems also are available.

More Users — "Applications of hydraulic presses are expanding rapidly. Many fabricators who weren't press users ten years ago are buying them now," says one of the major eastern manufacturers. Of all forming and shaping machine shipments in 1955, 16 per cent were hydraulic presses. Accelerated production with plastics and powdered metals is strengthening demand.

Hydraulic pressmakers say sales of extrusion presses to fabricators of steel and nonferrous metals are on the uptrend. Titanium extrusion is on the horizon. And more aluminum extrusions are going into office furniture, trucks and trailers. Extruders say the process cuts labor costs, saves metal and adds to its strength.

Good Investment — More orders for extrusion presses follow such developments as faster, more automatic handling of billets, larger press installations and production of equipment requiring little maintenance.

John C. Coonley, president, Hydraulic Press Mfg. Co., Mt. Gilead, O., sums up the situation this way: "Prospects for this year are better than last." Only two obstacles stand in the way: A shortage of heavy steel to make the complicated equipment and a shortage of engineers to design it.

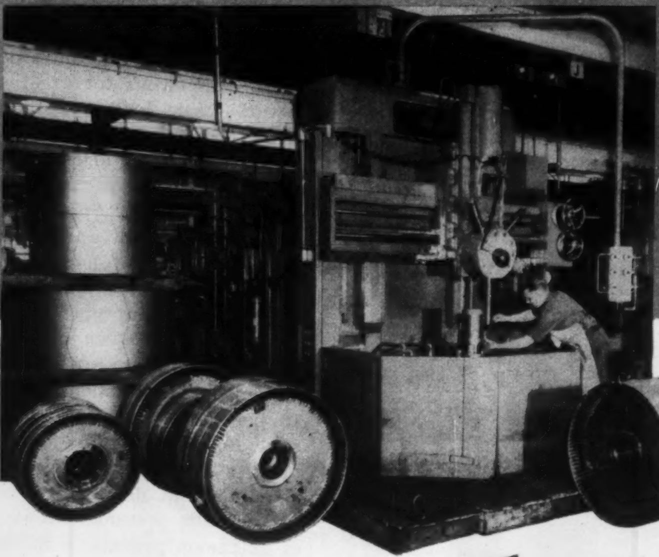
Less machining time and less spoilage

Results in 30% *increase in production*

With a... BULLARD ...

CUT MASTER V. T. L.

MODEL 75



At the Dynamatic Division of Eaton Manufacturing Company at Kenosha, Wisconsin, producers of adjustable speed eddy-current drives, couplings and brakes for industrial applications, the Bullard Cut Master V.T.L., Model 75 is employed to machine the clutch rotor assembly for a big industrial punch press drive.

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FIRST CHUCKING
1ST FACE HUB
2ND ROUGH & FINISH BORE
7.502" to 7.501"

SECOND CHUCKING
1ST FACE RIM
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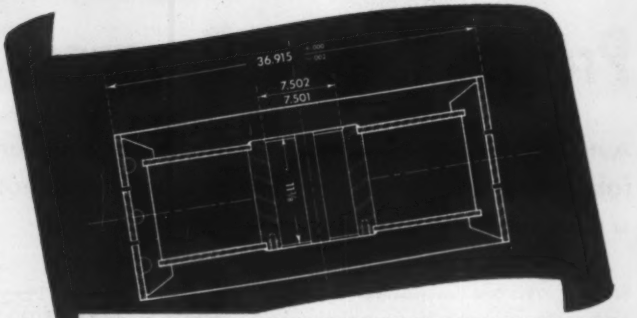

Both operator and management praise the performance of the Cut Master, Model 75, "there's no comparison; the old machines I had to fight . . . this one holds once it is set. Setting up is easier and the controls are handy . . . it is easy to keep up work standards with a minimum of spoilage." The advantages embodied in the Bullard Cut Master V.T.L., Model 75 can be applied to your machining problems.

CALL YOUR NEAREST BULLARD SALES OFFICE OR DISTRIBUTOR OR SEND FOR COMPLETE CATALOG TO

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Please send me a copy of the
NEW CUT MASTER V.T.L., MODEL 75 CATALOG

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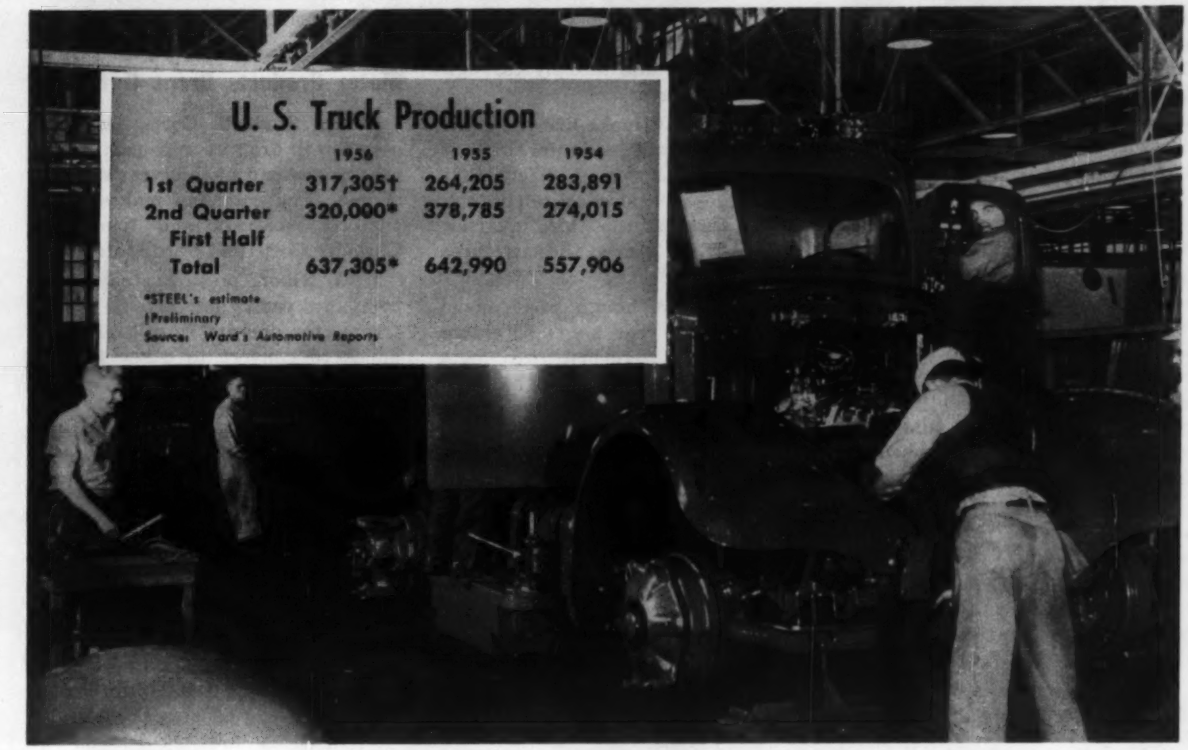

U. S. Truck Production

	1956	1955	1954
1st Quarter	317,305†	264,205	283,891
2nd Quarter	320,000*	378,785	274,015
First Half Total	637,305*	642,990	557,906

*STEEL's estimate
†Preliminary
Source: Ward's Automotive Reports

Heavy White trucks roll along the line

Trucks Take the Lead

Production is running 20 per cent ahead of last year's; sales are even better. Heavier units are the best sellers, particularly to the construction industry

TRUCKBUILDERS look for higher sales and a slight production increase in the second quarter. In the first quarter, production was 20 per cent ahead of the mark for the same period last year.

Quarterly sales figures aren't available, but it's estimated that the increase will be about 25 per cent. Heavy-duty trucks are the strong sellers this year.

White Reports — Robert F. Black, president, White Motor Co., Cleveland, says: "Our unit deliveries for the first quarter are 28 per cent higher than they were for the same period last year. In the January-March quarter, 1955, White delivered 3818 units."

Reo Motors Inc., Lansing, Mich., reports that its sales are up 12 per cent over those in last year's first quarter. The company expects a 20-per-cent gain in the second three months.

Speaking of the industry, Mr. Black adds: "With this type of increase, there is every indication that heavy-duty, over-the-highway trucks and tractors will set a new record this year." The record: 80,000 units in 1955.

Reasons — Booming expansion, particularly in construction, accounts for higher production and sales of heavy-duty trucks in the 16,000-lb-and-over classes. With huge road building programs just around the corner (see page 51), many construction firms are adding to their rolling stock and off-the-highway equipment.

Reo Motors expects its heaviest demand from roadbuilders. Other companies report graders, scrapers, dump trucks and cement mixers are selling better than they ever have.

More and more states are permitting heavier trucks on the highways. New York and Pennsylvania recently changed their weight restrictions. Other states are expected to follow. This is resulting in more orders from long distance fleet truck owners who want to increase pay loads.

Small industries are catching up, too. They are ordering trucks with greater capacities than they need. These companies expect to have full pay loads by the end of the year.

Soft Spot—Sales of lightweight pickup and utility models are slow. No two people agree as to

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why, but some factors stand out.

Backlogs in lightweight trucks are high. Small farmers can't afford to buy as many this year as they have in the past. Some industry experts believe they are waiting to see if high farm parities will be maintained. If so, orders probably will increase rapidly.

Contrary—Studebaker Division, Studebaker-Packard Corp., South Bend, Ind., points out that current factory orders for ½-ton trucks are 70 per cent higher than they were last year. Sixty-three per cent of these are retail orders from customers. Only 7 per cent are stockpiled against the spring sales rush. Indications are that most of these utility jobs are scheduled for industrial use.

Orders for 1 and 1½-ton models are only 5 and 3 per cent above last year's. This seems to be the weakest spot in the market. One-ton stake trucks are particularly popular with medium-sized farmers who use them for a variety of jobs.

Pattern—General Motors Corp.'s Truck & Coach Division, Pontiac, Mich., says that its light-duty trucks are "selling well." The lightweights make up about 66 per cent of the division's volume. Heavy-duty jobs (5 tons and up) are "selling better than average," says the division. This seems to be the pattern in the industry.

Willys Motors Inc., Toledo, O., reports that although domestic retail sales are down slightly from 1955's, first quarter export volume will set a new high. In the first two months of this year, domestic and foreign sales of Jeeps were 7.5 per cent higher than they were during the same period last year.

Diesels—The oil burners are moving better this year than last, say most of the heavy-duty builders. Diamond T Motor Car Co., Chicago, and Reo Motors report that orders for diesel-powered rigs are growing steadily. White predicts that 25 per cent of its 1956 output will be diesels. Last year, 14 per cent of its trucks sported diesel engines.

Trends — February is traditionally a slow production month for trucks as well as autos. This year is no exception, but it looks like the peaks and valleys won't be so sharp as they were last year.

In 1955, model changes and slow sales caused truck production to drop to about 61,000 units in February. It shot to a peak of 130,000 in May, then slid sharply through the third quarter.

This year, it looks like the first-half pattern will be similar, but not so drastic. It's quite likely that production will stay on fairly high levels through the third quarter, with a slight rise in the last three months.

Comfort—Although basic model changes this year aren't so extensive as they were last year, more emphasis is being placed on comfort and smooth handling. GM points out that air suspension units will be on its heavy-duty trucks this fall. Road shock dampers already are out on some GM pickups and utility models.

Studebaker claims its nonslip differential will be a potent sales factor. First trucks with these units are coming off the line. Customer queries indicate that this may be partly responsible for the surge of orders for Studebaker's ½-ton models.

As wages rise, more businessmen realize that transportation costs are one spot where they still can save money and keep final product prices down.

U. S. Auto Output

Passenger Only

	1956	1955
January	611,190	659,508
February	554,801	674,951
March	575,559†	792,436
April		752,245
May		723,868
June		648,412
July		658,696
August		613,705
September		460,443
October		517,788
November		749,061
December		682,256
1st Qtr.	1,741,550†	2,126,895
Total		7,933,369

Week Ended	1956	1955
Mar. 10	132,840	171,346
Mar. 17	131,207	176,194
Mar. 24	131,287	178,068
Mar. 31	125,850	177,295
Apr. 7	134,458†	168,002
Apr. 14	132,000*	175,133

Source: *Ward's Automotive Reports*
†Preliminary *Estimated by STEEL

Motor Products Drops Out

Motor Products Corp., Detroit, says it will drop its auto part business at the end of this year's model run. The company makes ventilators, moldings and trim for Chrysler Corp. and Ford Motor Co.

R. J. Nixon, president, says the company can't get enough contracts to operate profitably. It hopes to convert to other manufacturing work. He adds: "A lack of reasonable profits, a price squeeze in automotive part prices and the integration policies of auto manufacturers are some of the reasons for getting out of the business."

Chrysler says it is considering making some of the parts it buys from the company.

A sidelight to the affair comes from UAW spokesmen in Detroit. They indicate that if Motor Products has to lay off men this fall, it may bring the first big demand on SUB funds. The company's unemployment plan is similar to Ford's.

Layoffs are likely because Mr. Nixon says it will take from six months to a year to convert the company's Mack avenue (Detroit) plant. It employs about 1700.

Packard Subsidiary Expands

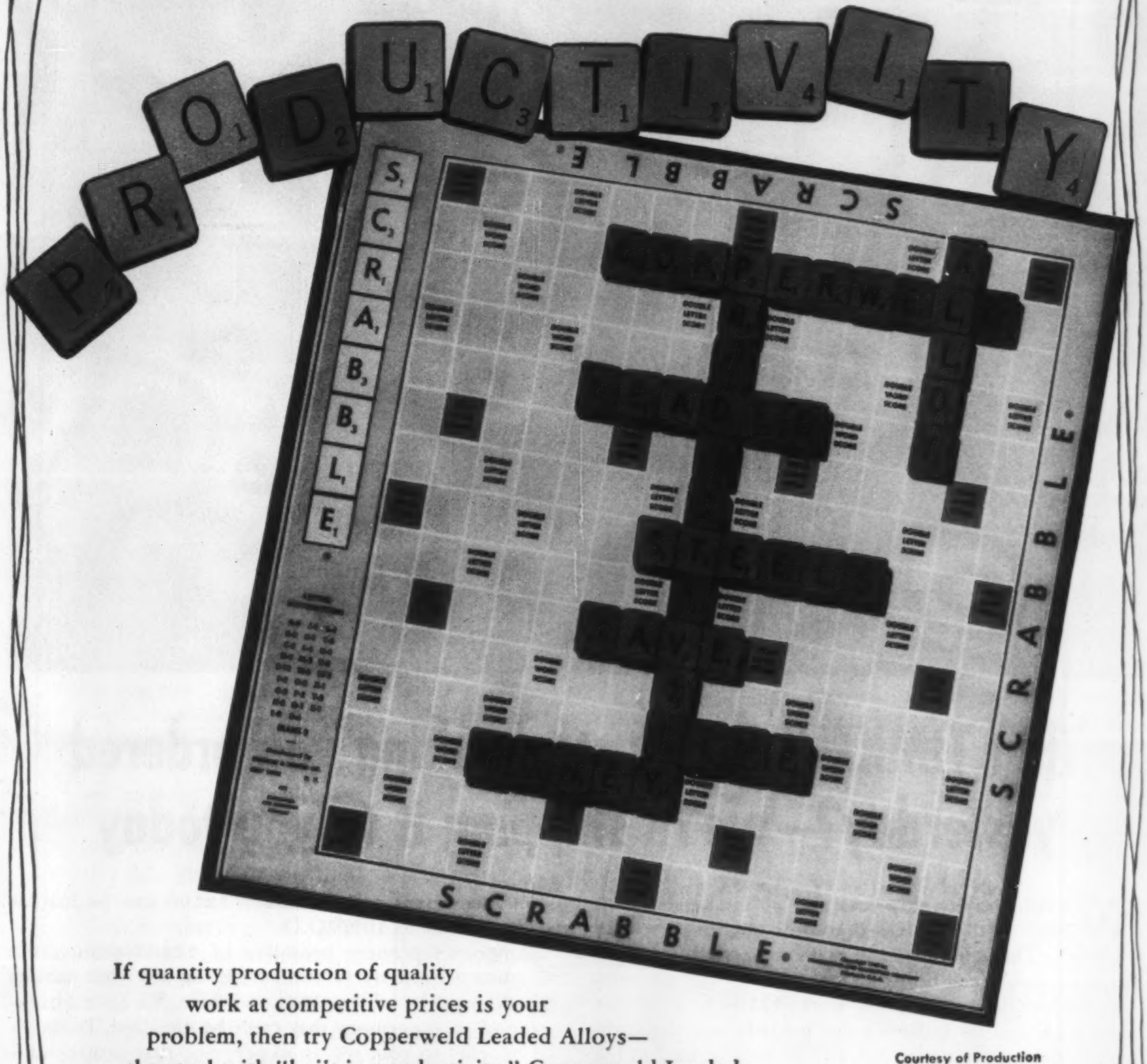
The Aerophysics Development Corp., Santa Barbara, Calif., has started a $1.3-million plant expansion program.

Owned by Studebaker-Packard Corp., Detroit, the firm does research and development work for the armed forces and the Atomic Energy Commission.

Construction of a 56,000-sq-ft engineering building and a 55,000-sq-ft research center is expected to be completed by September. It's rumored that Studebaker-Packard is interested in increasing its defense business in the face of lower automobile sales. The company recently acquired a J-57 jet engine contract from the Air Force.

Preliminary estimates from *Ward's Automotive Reports* show that combined S-P production is down about 38 per cent from 1955.

the whole story is built around...



If quantity production of quality work at competitive prices is your problem, then try Copperweld Leaded Alloys—the steel with "built-in productivity." Copperweld Leaded Steels allow faster feeds and speeds, give longer tool life, and their finer finish often eliminates a finishing operation. Copperweld Leaded Steels can truly save you time and money.

Courtesy of Production and Marketing Company.

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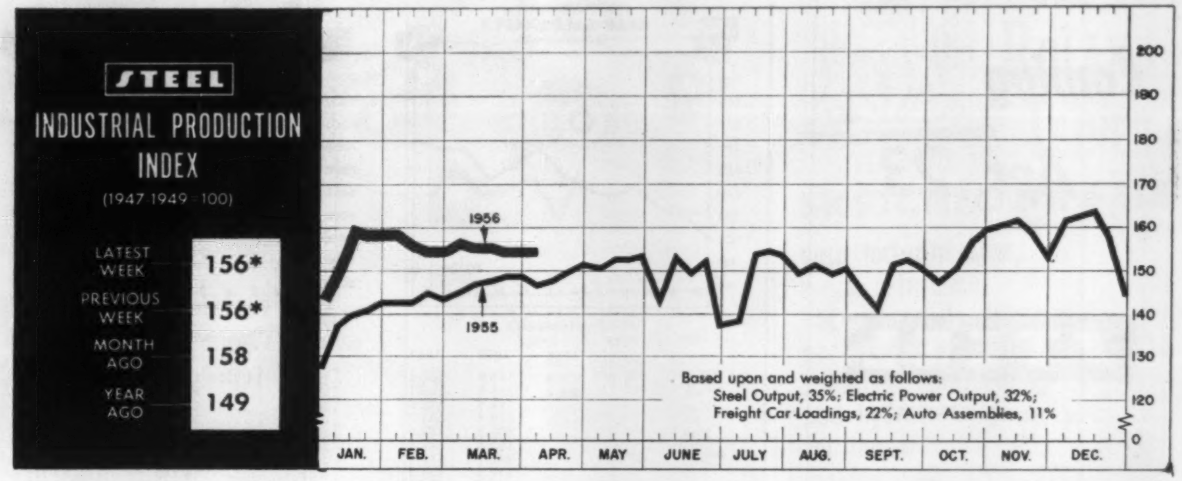
YEARS AHEAD—THROUGH EXPERIENCE AND RESEARCH

TIMKEN STEEL

SPECIALISTS IN FINE ALLOY STEELS, GRAPHITIC TOOL STEELS AND SEAMLESS TUBING



Based upon and weighted as follows: Steel Output, 35%; Electric Power Output, 32%; Freight Car Loadings, 22%; Auto Assemblies, 11%

*Week ended Apr. 7

Consumer Credit Still Within Bounds

MUCH ADO has been made over rising consumer credit and the ability of the installment buyer to pay off his debts, but the situation doesn't seem to be too bad on the basis of a report from the National Foundation for Consumer Credit Inc., Washington.

The foundation claims that 56 per cent of all family spending units owe nothing on installment accounts—purchases or loans. This means that 30 million families are practically debt free. Of the total 54 million family units, 44 million either owe nothing or less than $500. Sixty-three per cent of those making installment payments will clear up their debts within one year.

Who Owes?—"Installment credit fast is becoming a matter of convenient allocation of payments from substantial family income. In past years, it was correctly labeled the poor man's charge account," the foundation says.

One reason for the rapid increase in consumer credit over the last few years is the rise of the $3000-$7500 income group. Today, there are six times as many families in this bracket as in 1941. "It is people with such income who can best afford to purchase and borrow on installments," the foundation claims. About 83 per cent of the families owing more than $500 earn over $3000 a year.

Corroboration—February figures compiled by the Board of Governors of the Federal Reserve System show no cause for alarm about consumer credit. Total installment credit in February increased only $15 million from the preceding month, compared with an increase of $72 million during the corresponding month last year. Following the decrease reported in January, total installment credit is still below the December record.

In the meantime, earning power—and the power to repay—is increasing. Total personal income in February was at an annual rate of $313.1 billion, up $400 million from January. A decline in the

BAROMETERS OF BUSINESS

	LATEST PERIOD*	PRIOR WEEK	YEAR AGO
INDUSTRY			
Steel Ingot Production (1000 net tons)[2]	2,414[1]	2,406	2,284
Electric Power Distributed (million kw-hr)	11,000[1]	10,992	9,633
Bitum. Coal Ouptput (1000 tons)	10,290[1]	9,900	7,360
Petroleum Production (daily avg—1000 bbl)	7,150[1]	7,149	6,811
Construction Volume (*ENR*—millions)	$276.5	$459.5	$335.0
Auto, Truck Output, U. S., Canada (*Ward's*)	171,349[1]	160,027	207,089
TRADE			
Freight Car Loadings (1000 cars)	700[1]	725	663
Business Failures (Dun & Bradstreet)	275[1]	263	211
Currency in Circulation (millions)[3]	$30.318	$30,249	$29,900
Dept. Store Sales (changes from year ago)[3]	+6%	+9%	+11%
FINANCE			
Bank Clearings (Dun & Bradstreet, millions)	$20.631	$22,217	$20,987
Federal Gross Debt (billions)	$276.3	$276.3	$277.1
Bond Volume, NYSE (millions)	$24,937	$15,889	$14,117
Stocks Sales, NYSE (thousands of shares)	14,194	11,391	9,432
Loans and Investments (billions)[4]	$85.6	$86.5	$83.5
U. S. Govt. Obligations Held (billions)[4]	$28.0	$28.7	$32.9
PRICES			
STEEL's Finished Steel Price Index[5]	209.10	209.10	194.53
STEEL's Nonferrous Metal Price Index[6]	278.2	278.3	237.1
All Commodities[7]	113.2	112.9	110.4
Commodities Other Than Farm & Foods[7]	120.9	120.8	115.7

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*Dates on request. [1]Preliminary. [2]Weekly capacities, net tons: 1956, 2,461,893, 1955, 2,413,278. [3]Federal Reserve Board. [4]Member banks, Federal Reserve System. [5]1935-1939=100. [6]1936-1939=100. [7]Bureau of Labor Statistics Index, 1947-1949=100

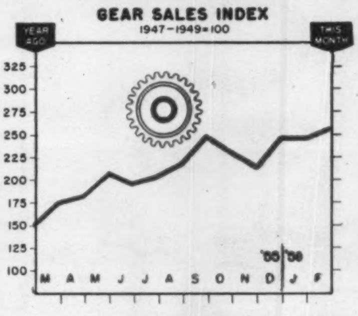
Coming
Apr. 23
IN
STEEL

Ideas for Industry

A midwestern appliance maker had to step up production, and it looked as if a $200,000 conveyor was needed to turn the trick. Several men in the shop kicked the problem around during their lunch hour. Result: The plant's material handling system was modified to handle the heavier load. Cost: $4000. Saving: $196,000.

This article tells you how you can use the same technique on practically any business problem you have. It's called brainstorming. Imagination is given free rein. Noncreative conferences are turned into idea-generating sessions.

THE BUSINESS TREND



	1956	1955	1954
Jan.	245.5	140.9	167.4
Feb.	256.2	148.5	165.1
Mar.	....	172.8	128.6
Apr.	....	179.8	158.2
May	....	205.2	132.5
June	....	193.5	127.4
July	....	201.7	141.3
Aug.	....	217.6	154.7
Sept.	....	246.5	135.1
Oct.	....	227.6	152.3
Nov.	....	210.4	116.7
Dec.	....	245.5	182.2

American Gear Mfrs. Assn.

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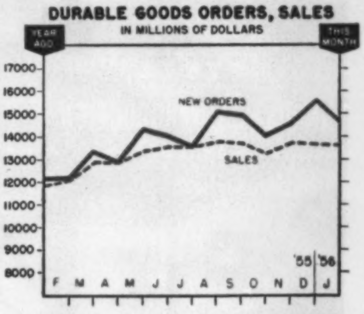

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May	.....	14,331	.....	13,322
June	.....	14,033	.....	13,527
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Sept.	.....	14,936	.....	13,692
Oct.	.....	14,094	.....	13,261
Nov.	.....	14,680	.....	13,721
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U. S. Office of Business Economics

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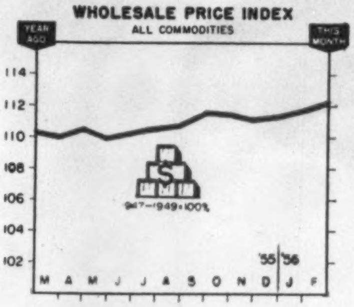
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ALL COMMODITIES

	1956	1955	1954
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Feb.	112.3*	110.4	110.5
Mar.	....	110.0	110.5
Apr.	....	110.5	111.0
May	....	109.9	110.9
June	....	110.3	110.0
July	....	110.5	110.4
Aug.	....	110.9	110.5
Sept.	....	111.7	110.0
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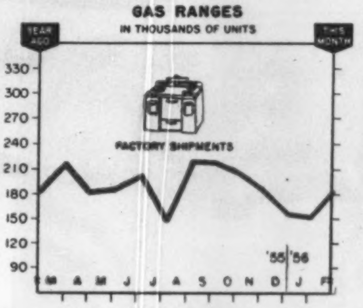
U. S. Bureau of Labor Statistics
*Preliminary


GAS RANGES
IN THOUSANDS OF UNITS

Shipments—Units	1956	1955	1954
Jan.	151,900	152,900	137,000
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May	....	187,400	163,800
June	....	203,900	174,300
July	....	145,700	134,500
Aug.	....	218,600	179,400
Sept.	....	217,700	203,900
Oct.	....	207,800	197,100
Nov.	....	183,000	174,000
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Total	....	2,255,500	2,024,800

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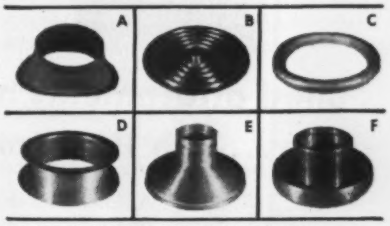

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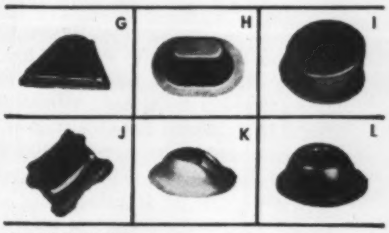

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Coming

Apr. 23

IN

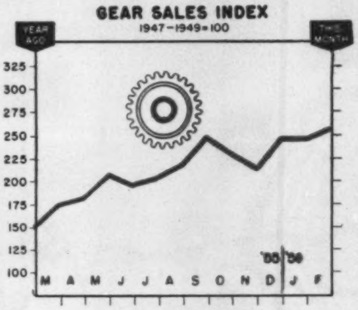
STEEL

Ideas for Industry

A midwestern appliance maker had to step up production, and it looked as if a $200,000 conveyor was needed to turn the trick. Several men in the shop kicked the problem around during their lunch hour. Result: The plant's material handling system was modified to handle the heavier load. Cost: $4000. Saving: $196,000.

This article tells you how you can use the same technique on practically any business problem you have. It's called brainstorming. Imagination is given free rein. Noncreative conferences are turned into idea-generating sessions.

THE BUSINESS TREND



	1956	1955	1954
Jan.	245.5	140.9	167.4
Feb.	256.2	148.5	165.1
Mar.	....	172.8	128.6
Apr.	....	179.8	158.2
May	....	205.2	132.5
June	....	193.5	127.4
July	....	201.7	141.3
Aug.	....	217.6	154.7
Sept.	....	246.5	135.1
Oct.	....	227.6	152.3
Nov.	....	210.4	116.7
Dec.	....	245.5	182.2

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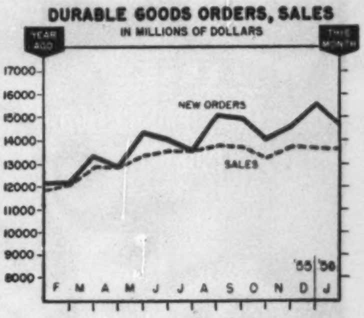

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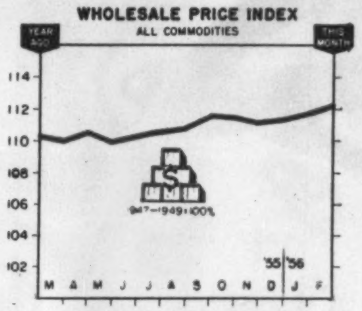

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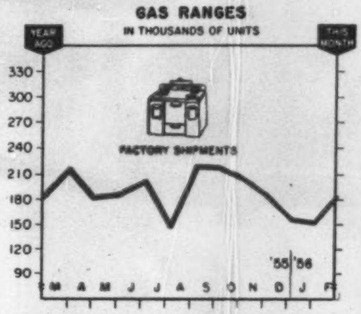

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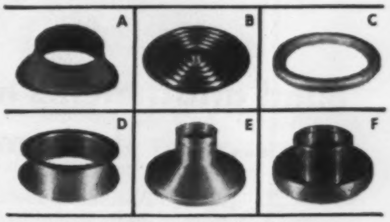

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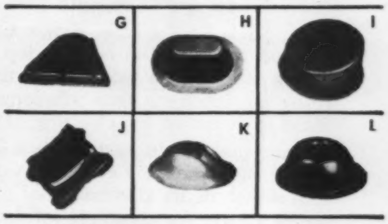

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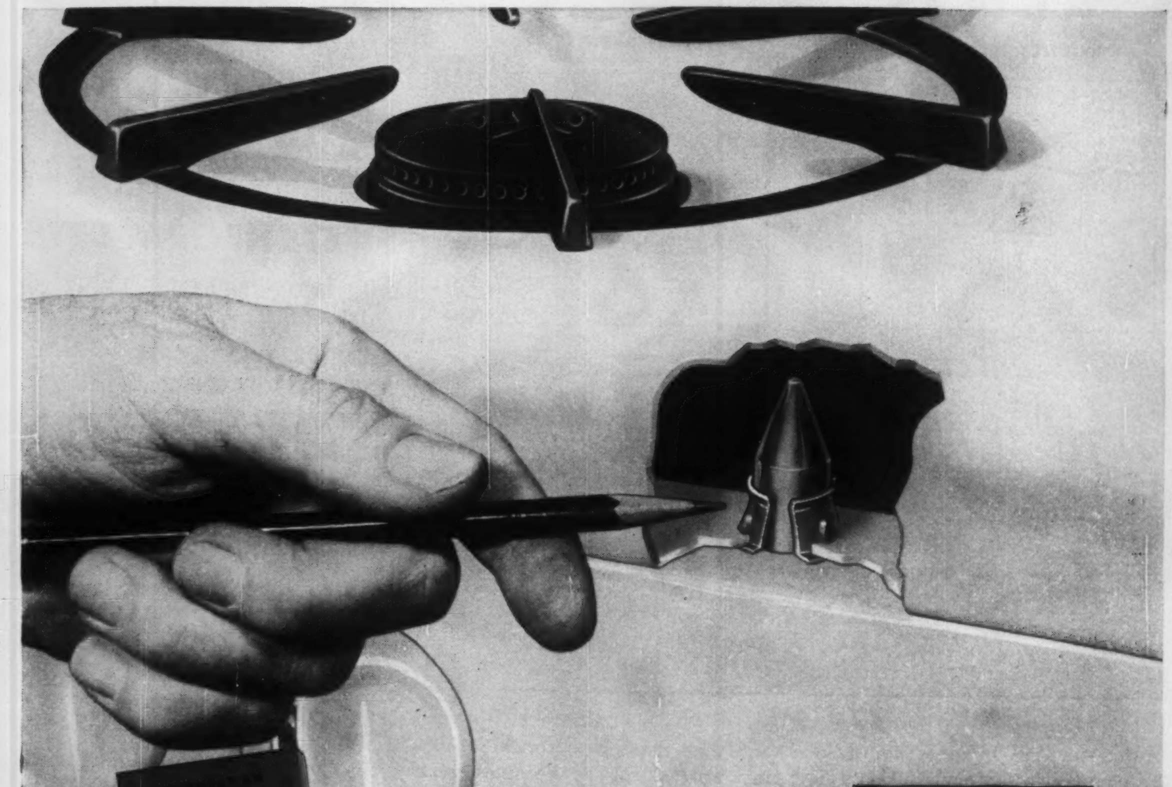

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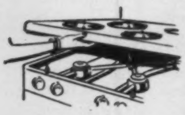

Automatic Range Company, Brooklyn, cut assembly costs on its Royal Rose Ranges 82% with a Tinnerman tubular-type SPEED CLIP®. It locks the removable range tops securely in place. Automatic Range designers were able to eliminate a costly bracket, a wire form catch and a spot welding operation with this engineered fastener.

One-piece, spring-steel SPEED CLIPS are quickly and easily snapped into punched holes in the range's top. Self-retained, the SPEED CLIP grips the mating stud in the front panel flange with pin-point accuracy under live spring tension for a firm, vibration-proof attachment. Yet the top is readily raised or removed for cleaning or servicing . . . no tools required!

Tinnerman produces more than 8,000 different types and sizes of SPEED NUT brand fasteners. They are designed to help you make faster, easier, more efficient attachments at substantial assembly savings. Consult your Tinnerman representative for complete information on standard or specially engineered SPEED NUTS. Also write for your copy of "SPEED NUT Savings Stories."

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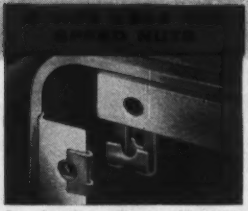
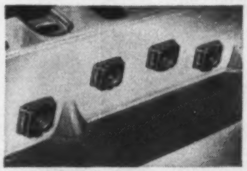
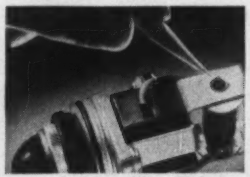


In a heating-unit assembly, "J" type SPEED NUTS eliminate problems of hole misalignment and paint clogging.



On truck radiators, costly retapping of flash-clogged threads of weld-type fasteners is eliminated by SPEED GRIPS.



On an indicator light, Tubular SPEED CLIP replaces 4 parts, reduces parts cost and handling.

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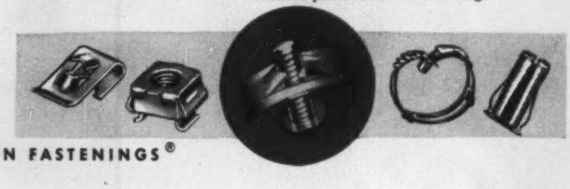


H. G. COFFEY
. . . Aetna-Standard Engineering president

L. G. JANZOW
. . . California Steel Products v. p.

F. W. DOYLE
. . . sales mgr. of new Perfex division

H. G. Coffey succeeds **E. E. Swartswelter** as president of **Aetna-Standard Engineering Co.,** Pittsburgh. Mr. Swartswelter was named chairman and chief executive officer. **William Rodder** was made first vice president. **Glenn W. Garwig** was made vice president-sales, cold-drawn division; **A. J. Morgan** vice president-sales, flat rolled products division; and **Frank E. Turner,** vice president in charge of pipe and tube sales.

Ward A. Folsom was made general manufacturing manager of **Ford Division,** Ford Motor Co., Dearborn, Mich. He succeeds **M. L. Wiesmyer,** who was promoted to the staff of L. D. Crusoe, executive vice president, car and truck division, as manufacturing consultant.

Square D Co., Detroit, named **William Younger** eastern sales manager and **William Moriarty** distributor sales specialist.

Ralph F. Peo, president of **Houdaille Industries Inc.,** Buffalo, was elected chairman and will serve in both capacities. As chairman, he succeeds **Charles Getler,** retired.

Shallway Corp., Connellsville, Pa., appointed **Charles Lay** its Shalco shell molding equipment service manager. Mr. Lay formerly was vice president of Upstate Metal Casting Co.

L. G. Janzow was made vice president and general manager, **California Steel Products Division,** Adsco Industries Inc., Richmond, Calif. He has been serving as vice president-engineering since joining the division in May, 1954.

Kenneth M. Gleszer was elected executive vice president and **Anthony J. Zino Jr.** vice president-sales for **Dixon Sintaloy Inc.,** Stamford, Conn. Mr. Gleszer has headed operations of the powder metal division. Mr. Zino was sales manager.

Royce J. McDonald was appointed chief engineer, **Darlyn Products Corp.,** San Diego, Calif.

Ellis B. Gitchell was named maintenance superintendent of all plants of **Leece-Neville Co.,** Cleveland.

J. Frederic Byers Jr., formerly executive vice president, was elected president of **A. M. Byers Co.,** Pittsburgh. He succeeds **A. B. Drastrup,** resigned.

Nick W. Cox, following an extended illness, returns to **Korhumel Steel & Aluminum Corp. of Wisconsin,** Milwaukee, as manager of aluminum sales. **Bernard A. Schultz** was made plant superintendent.

Clare Mason was named executive vice president of **Electronic Specialty Co.,** Los Angeles.

Perfex Corp., Milwaukee, appointed **F. W. Doyle** sales manager of a new division formed to develop, sell and manufacture specialized heat transfer products and other assemblies. **Gene T. Neudeck,** formerly with National Water Lift Co., assumes Mr. Doyle's duties as assistant sales manager, Industrial Radiator Division.

Henry E. Jensen, vice president-engineering at **C & D Batteries Inc.,** Conshohocken, Pa., now heads up both engineering and marketing. He has been elected to the new post of vice president in charge of engineering and marketing. In marketing, he succeeds **Samuel W. Gibb,** vice president-sales, who is taking an indefinite leave of absence.

Wilbur Deutsch was named sales manager, industrial lubrication department, **Aro Equipment Corp.,** Bryan, O. He was general sales manager of Trabon Engineering Corp.

Edward R. Eggleston, chairman of the coke oven committee, **Republic Steel Corp.,** succeeds **John M. Komp,** retired, as general superintendent of coke plants at the Cleveland district.

Clarence R. Manning was named works manager in charge of time equipment engineering and manufacturing at the Endicott, N. Y.,

WILLIAM B. ILKO
. . . sales manager, American Chain Div.

ROBERT G. BURSON
. . . sales mgr. of Dayton Rubber division

W. E. ROWE
. . . Long Mfg. Division manufacturing mgr.

plant of **International Business Machines Corp.**

William B. Ilko was made sales manager, **American Chain Division**, American Chain & Cable Co. Inc., at York, Pa. He succeeds **W. D. Kirkpatrick**, vice president and sales manager of the division, who retired after more than 41 years of service.

Walter Michel was made general manager of the Utica, N. Y., division of **Bendix Aviation Corp.** He succeeds **Donald M. McGrath.**

Earle L. Kropscott was made staff manager of molding materials for **Dow Chemical Co.'s** plastics department, Midland, Mich.

W. M. Spain, formerly St. Louis district sales manager, was made north central regional sales manager for **Federal Pacific Electric Co.**, with headquarters in Chicago.

Ralph L. Vaughn was made superintendent of industrial engineering at **Kaiser Steel Corp.**, Fontana (Calif.) Works.

Robert L. Jenkins was promoted to methods manager, **Dodge Division**, Chrysler Corp., Detroit. He is succeeded as quality control manager by **Allan D. Woodell.**

Harry N. Cantrell was named supervisor of computational research for **General Electric Co.'s** large steam turbine-generator department, Schenectady, N. Y.

Robert G. Burson was appointed sales manager of the industrial V-belt division of **Dayton Rubber Co.**, Dayton, O. He succeeds **J. W. Torrant**, retired to enter business for himself in the New England area.

B. E. Anderson was made chief engineer, **Federated Metals Division**, American Smelting & Refining Co., at Salt Lake City, Utah. **Arthur F. Kohn Jr.** becomes assistant to the general manager of Federated at Perth Amboy, N. J., and **Robert D. Mathis** was named superintendent of the Los Angeles plant.

O'Sullivan Rubber Co., Winchester, Va., appointed **T. T. Lewandowski** assistant sales manager, plastics division.

M. B. Gault was made general sales manager, cooking appliance controls division, **Robertshaw-Fulton Controls Co.**, with headquarters at executive offices, Greensburg, Pa. He succeeds **Frank H. Post**, now vice president-general manager of Robertshaw-Thermostat Division.

Herbert O. Patchel Jr. was elected a vice president and appointed assistant to the president of **Babb Co. Inc.**, with headquarters in Phoenix, Ariz. He was with Rheem Mfg. Co.

G. R. Moore, manager, valve division, **Thompson Products Inc.**, Cleveland, was elected a vice president of the company.

W. E. Rowe was made manufacturing manager of **Long Mfg. Division**, Borg-Warner Corp., at Detroit, and **L. W. Cartier** was made manager of quality control for both Long and the **Detroit Gear Division.** **W. E. Lang** was named director of industrial relations for Long and Detroit Gear.

Kaman Aircraft Corp., Bloomfield, Conn., elected **Edward J. Odlum** senior vice president; **Edward G. Conway**, vice president-works manager; and **John O. Emmerson**, vice president-chief engineer.

Robert N. Long was named general sales manager of **Southern Steel & Stove Co.**, Richmond, Va.

Eugene Salinger was made assistant general manager at the **Riverside, N. J., Metal Division** of H. K. Porter Company Inc.

J. C. Price Taylor was made manager of crusher and pulverizer sales for **Jeffrey Mfg. Co.**, Columbus, O.

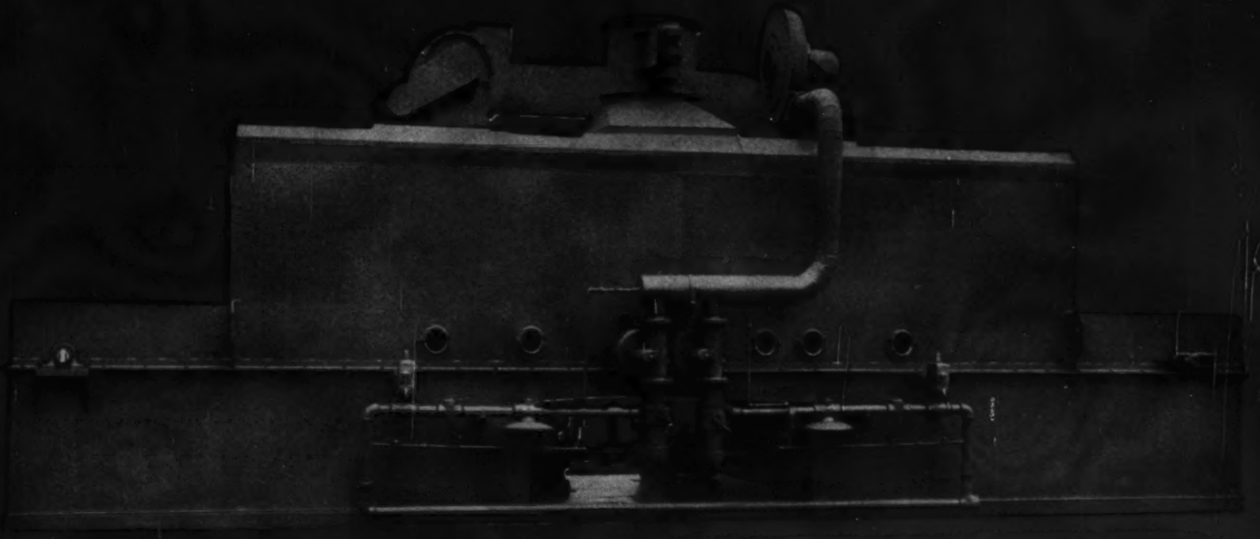
Robert W. Squibb was appointed works metallurgist for the Zanesville, O., works of **Armco Steel Corp.** He succeeds **Carl E. Gifford.**

Herman E. Happel was appointed director of research and development at **Atkins Saw Division**, Borg-Warner Corp., at Indianapolis.

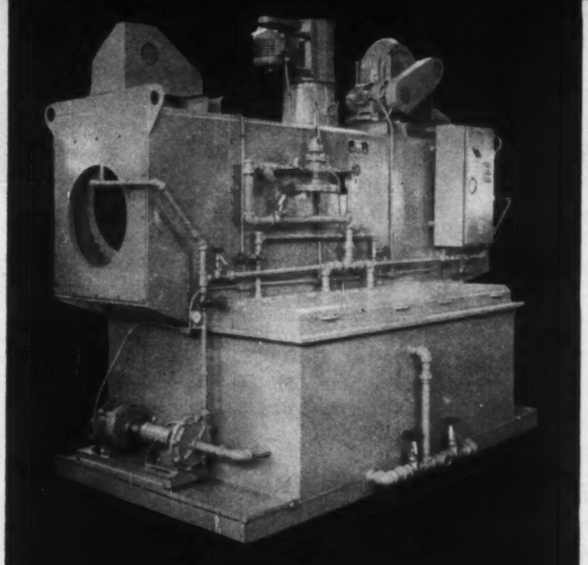
Dravo Corp. named **E. R. Hyde** operations manager of its Keystone, Pa., division. **L. E. Manning** suc-

CLEAN START for a FINE FINISH

PD POWER SPRAY WASHERS EXCEL IN PARTS CLEANING and SURFACE TREATING



Typical of the numerous types of P-D Industrial Washing Equipment is this Two Stage Gas-Fired Power Spray Washer.



Two Stage and Blow-Off Helical Drum Washer.

Low in cost . . . high in efficiency . . . are these Peters-Dalton Two Stage Power Spray Washers. All sizes, types and required uses can be developed to meet your needs.

Regardless of the size or weight of your product, the proper cleaning and surface treatment for it can be developed by Peters-Dalton engineers and at lowest cost to you. This organization of specialists has for more than a quarter century met *and exceeded* the needs of customers in almost every phase of industry where finishing processes such as these are required.

Put your problems in our hands . . . give us the requirements you must have for the best and most economical way of cleaning or surface treating your parts. Just write, wire or phone . . . we'll be glad to tell you more.

We'll be glad to tell you more. Just write, wire or phone.

Representatives in principal cities.

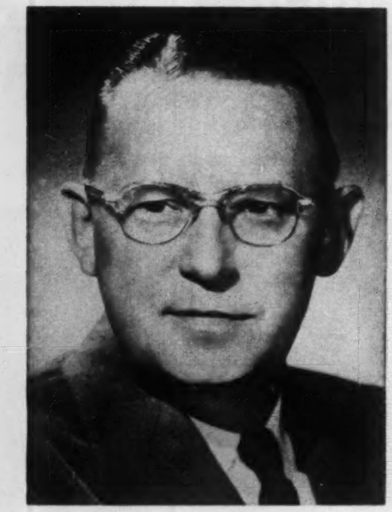
PD

Peters-Dalton INC.

A SUBSIDIARY OF DETROIT [illegible] CO.

[illegible] Ryan Road • Detroit [illegible], Michigan

- PD *Hydro-Whirl Paint Spray Booths*
- PD *Industrial Washing Equipment*
- PD *Drying and Baking Ovens*
- PD *Hydro-Whirl Dust Collecting Systems*



RICHARD E. WHINREY
. . . Link-Belt vice president

ceeds Mr. Hyde as manager of the south side plant, Pittsburgh.

Richard E. Whinrey, general manager of **Link-Belt Co.'s** Ewart plant in Indianapolis, was elected a vice president.

At **Goodyear Tire & Rubber Co.,** Akron, **P. W. Litchfield,** chairman, is relinquishing responsibilities as chief executive officer. President **E. J. Thomas** becomes top ranking officer of the company. Mr. Litchfield continues as chairman. Newly created executive vice presidencies are filled by **R. S. Wilson,** sales; **P. E. H. Leroy,** finance and accounting; and **R. DeYoung,** production, personnel, research and development. **Victor Holt Jr., L. E. Spencer** and **F. J. Carter** were elected vice presidents.

EDWARD R. GABRIEL
. . . Fay & Egan, Greaves Machine Tool post

J. A. Fay & Egan Co. and its **Greaves Machine Tool Division,** Cincinnati, appointed **Edward R. Gabriel** general manager. He was general sales manager. **J. W. Stewart,** sales analyst, was made general sales manager-controller.

Jones & Laughlin Steel Corp. appointed **Samuel H. Strohm** general manager of its electricweld tube division, Oil City, Pa. **Dale B. Kennedy,** former plant manager at Oil City, was made manager of operations for the division and **Howard N. Scott** was made manager of sales. Mr. Scott, former salesman of electricweld tube products, continues headquarters in Pittsburgh.

Homestead Valve Mfg. Co., Coraopolis, Pa., appointed **Ken W. Gorton** sales manager, valve division.

HERBERT L. NEWLIN
. . . B-L-H purchasing agent, Eddystone div.

Herbert L. Newlin was made purchasing agent for the Eddystone, Pa., Division, **Baldwin-Lima-Hamilton Corp.**

Republic Steel Corp., Cleveland, appointed **Charles T. Hapgood** an assistant manager of sales, pipe division. He was manager of the tubular products division of Jones & Laughlin Steel Corp. **John R. Sally** was made an assistant district sales manager for Republic at Houston. **Robert W. Cameron** was named an assistant superintendent, inspection of finished products, at the Youngstown district steel plant.

Hermann C. Hoffmann was named general sales manager of **Carrier Corp.'s** machinery and systems division, Syracuse, N. Y. He was assistant general sales manager.

OBITUARIES . . .

Russell C. Mahon, 65, founder and chairman of **R. C. Mahon Co.,** Detroit, died Mar. 30.

Hugh Gallaher, 62, vice president, **Penn Metal Co. Inc.,** New York, died Apr. 1.

Charles H. Abbott, 74, founder and former president, **Hartford Steel Ball Co.,** Hartford, Conn., died Apr. 1 in Florida.

G. Norman Knaus, president of **Syracuse Engineering Co., Thelan Iron Works, Syracuse Foundry** and **Syracuse Milling Co.,** all of Syracuse, N. Y., died Mar. 28.

Walter A. Richards, 74, president, **Micro Products Co.,** Chicago, died Mar. 27.

John P. Clark, 54, president, **Basic Steel Corp.,** Chicago, died Mar. 29.

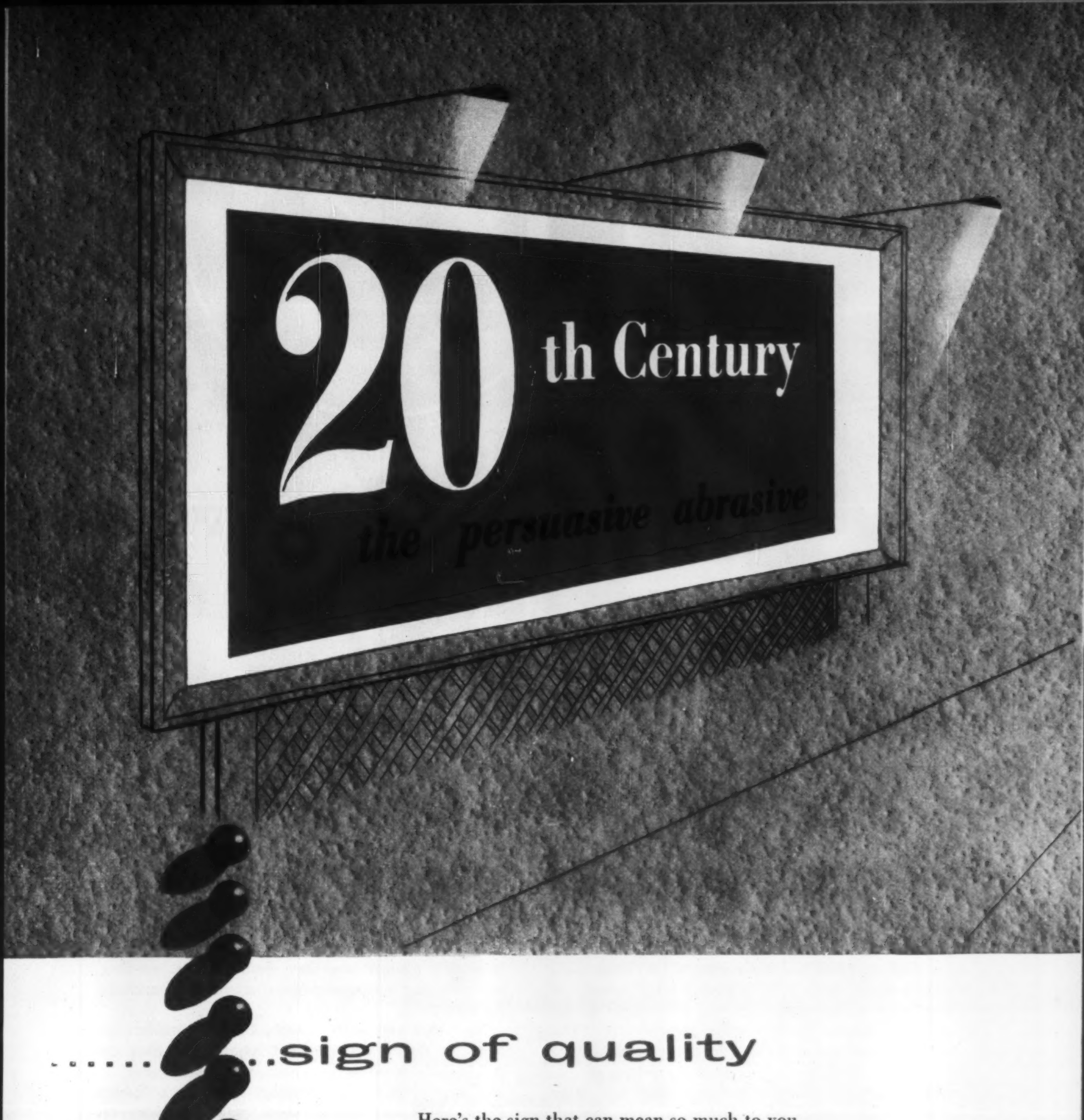
Norman E. Hart, 54, manager of production engineering at **Toledo Scale Co.,** Toledo, O., died Mar. 31.

John E. Andress, 79, founder and former chairman and president of **Barnes Drill Co.,** Rockford, Ill., died Mar. 26. He was chairman at the time of his retirement eight years ago.

C. Howard Megaw, 65, vice president, **K. Hettleman & Sons Inc.,** Baltimore, died Mar. 31.

John C. Graf, president, **Gordon Graf Co.** and owner of **J. C. Graf Co.,** Philadelphia, died Mar. 31.

Robert W. Thomas, 65, chairman, **McCrosky Tool Corp.,** Meadville, Pa., died Mar. 26.



........sign of quality

Here's the sign that can mean so much to you.

It's your assurance of premium quality metallic abrasives for any cleaning or peening requirement. Choose our *Normalized line, for example, which lasts as much as four times longer than other abrasives. Or our Toledo Realsteel, produced in our new Toledo Steel Shot Division, for consistently high uniformity.

Remember, when you buy 20th Century, you buy top performance.

Write for our catalog today.

The CLEVELAND METAL ABRASIVE Co.
802 East 67th St., Cleveland 8, Ohio
Howell Works: Howell, Michigan
Toledo Steel Shot Division: Toledo, Ohio

One of the world's largest producers of quality shot and grit — Hard Iron — Malleable (*Normalized) — Cut Wire — Cast Steel (Realsteel)

**Copyrighted trade name*

Ordinary hose, with rubber-composition liner, soon deteriorates from active solvents present in all paint materials.

DeVilbiss synthetic-compound liner lasts indefinitely, because it is specially formulated to withstand all solvents.

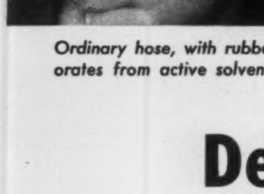
DeVilbiss-made paint hose resists solvent action longer

"Torture" tests, the most conclusive known for solvent-hose analysis, prove the superiority of DeVilbiss hose.

Fluid liners from DeVilbiss and other brands of paint hose, when exposed to the prolonged solvent action of common paint thinners, tell the story. The DeVilbiss liner shows no sign of deterioration, while others show marked changes from the effects of turpentine, acetones, ketones, acetates, toluol and other hydro-carbons — proof that DeVilbiss hose outlasts other makes in operations where paints are conveyed.

This laboratory evidence is your assurance of longer protection against hose-liner disintegration, swelling, and plugging — against paint contamination and discoloration!

Next time you order, specify DeVilbiss-made hose. Not only does it resist solvent action better, but also it is manufactured to closer dimensional tolerances . . . and is produced in a specialized DeVilbiss Rubber Plant, where the requirements of quality hose for spray painting have been a scientific study for over 40 years.



DeVilbiss' new oil-resistant air hose is specially compounded for long-lasting service with air tools that require lubrication through the air stream.

DeVilbiss hose connections fit all common sizes of all types of air and fluid hose; provide a smooth, tight-grip, leakproof connection; are reusable.

THE DEVILBISS COMPANY
Toledo, Ohio
Santa Clara, Calif. • Barrie, Ontario • London, England
Branch Offices in Principal Cities

FOR BETTER SERVICE, BUY
DEVILBISS

Borg-Warner Builds

Three projects will get most of $25-million outlay. B-W president sees second-best year in '56

BORG-WARNER Corp., Chicago, plans to spend approximately $25 million for expansion of its facilities this year. Three plants will get most of the expenditure, which is almost double the amount spent on expansion last year, says Roy C. Ingersoll, chairman.

The Marbon Chemical Division is getting a new $10-million chemical plant on the Ohio river at Washington, W. Va. The 322-acre site provides ample room for expansion. The Byron Jackson Division has under construction a new electronics plant and laboratory in Santa Ana, Calif. A multi-million-dollar B-W research center is being erected in Des Plaines, Ill. These additions will bring to $157 million the amount Borg-Warner has spent on expansion since the end of World War II.

Optimistic—Mr. Ingersoll thinks this will be one of the best years in the company's history. It will be second only to 1955 in both sales and earnings, he believes.

"I feel that the curtailment in the manufacture of automobiles . . . to permit a reduction in the car dealers' inventories . . . is healthy for the industry and should result in considerably increased production and sales in the last half of the year."

Overseas, Too—In addition to the three domestic projects, the company is building an $11-million plant at Borg-Warner Ltd., Letchworth, England. This is being financed in Britain. The plant will turn out automatic transmissions, semiautomatic overdrives, chains and sprockets and other components for the British auto industry.

In another announcement last week, Borg-Warner and York Corp. disclosed plans to merge. York, a large manufacturer of air conditioning equipment, would be operated as a division of B-W.

Norton Improves Service

Faster shipments to grinding wheel customers on the West Coast will be possible with the opening of the Norton Co.'s Santa Clara, Calif., plant on May 7. The plant, located at 2555 Lafayette St., was purchased by the company in 1954. Its conversion for grinding wheel manufacture began last year.

Acme To Build

Acme Chain Corp., a roller transmission chain manufacturer, will build a $600,000 plant in Holyoke, Mass. The plant, which will increase the corporation's manufacturing space to 85,000 sq ft, will be at the industrial park site of the Holyoke Water Power Co.

New Component Plant

Automotive & Aircraft Division, American Chain & Cable Co., Adrian, Mich., is constructing a new branch manufacturing plant at Fairfield, Iowa. Aug. 1 is the scheduled completion date. The plant will make components for the automotive, aircraft and outboard motor industries.

Gunite To Double Output

Gunite Foundries Corp., Rockford, Ill., announced a $1-million expansion program to increase its production of cast-steel wheels, brake drums and wheel assemblies for heavy-duty trucks, trailers and busses. A new acid-electric furnace, added pouring floors and additional mechanized handling equipment will double Gunite's capacity for producing electric-steel castings.

Aluminum, Cooling Firms Merge

To coincide with an anticipated increase in the market for products used by refrigeration and air conditioning units, Bohn Aluminum & Brass Corp., Detroit, purchased a plant in Danville, Ill. Last month, the corporation acquired the assets of the Betz Corp., Hammond, Ind., manufacturer of commercial refrigeration and air conditioning equipment, and will use the Danville plant for the Betz operation.

Operates AEC Uranium Mill

National Lead Co., New York, took over the operation of the Atomic Energy Commission's ura-

(*Please turn to page* 82)

LOOK TO DEVILBISS for all your spray equipment needs!

DeVilbiss offers the industry's most complete line of spray equipment — spray guns, spray booths, air compressors, hose and connections — for cold or hot-spray applications . . . manual, semi-automatic, or fully automatic operations.

At your service are a free training school for your operators and supervisors, and a complete research laboratory to analyze your particular coating problems. Call our nearest representative now!

DeVilbiss spray guns are lightweight, comfortably balanced. High-speed, large-capacity types, or small precision models.

DeVilbiss air compressors deliver up to 22.6% more air per dollar than most others. Stationary and portable models. ¼ thru 15 h.p.

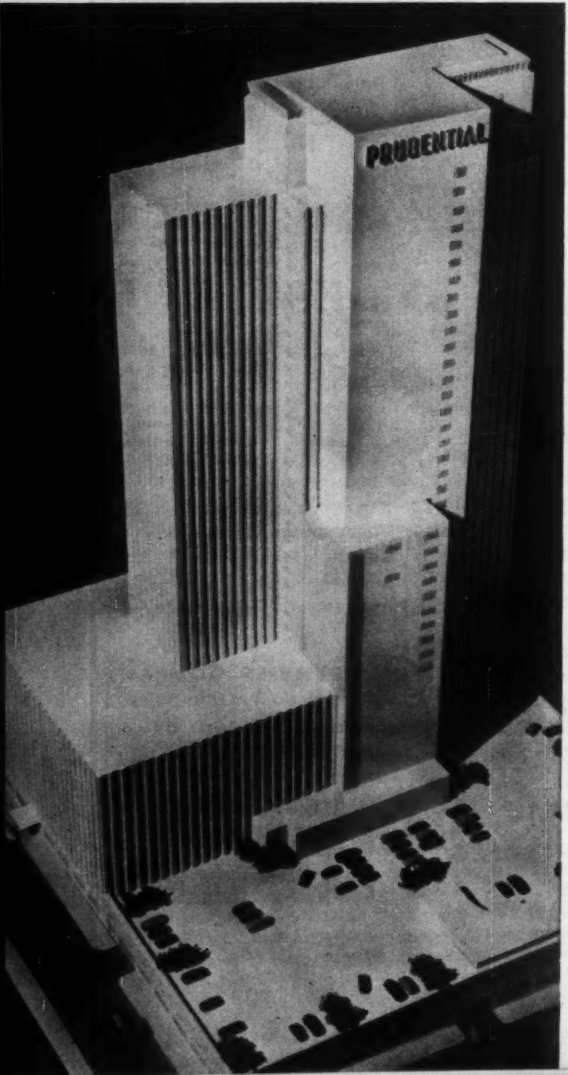
DeVilbiss spray booths come in a complete range of types, sizes. Standard, fireproof, reinforced steel panels.

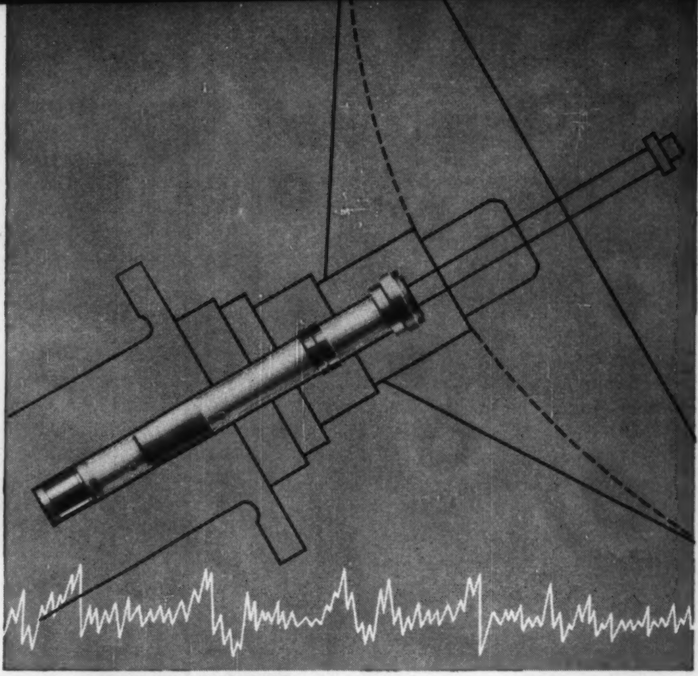
THE DEVILBISS COMPANY
Toledo 1, Ohio
Santa Clara, Calif. • Barrie, Ontario
London, England
Branch Offices in Principal Cities

FOR BETTER SERVICE, BUY
DEVILBISS

THE MACHINE GUNS OF the F2H-3 McDonnell Jet Interceptor pack a wallop. Mounted over the gun muzzles are Stainless Steel gun blast tubes of USS National Seamless, which restrain high pressures caused by firing the gun and also prevent the backflow of dangerous muzzle gases into the plane itself.

PRUDENTIAL INSURANCE COMPANY'S new Chicago office building employed in its construction more than 162 tons of National Seamless Pipe, diameters ranging from 2 to 20 inches, for heating and air conditioning. No other pipe offers safer and more efficient service.

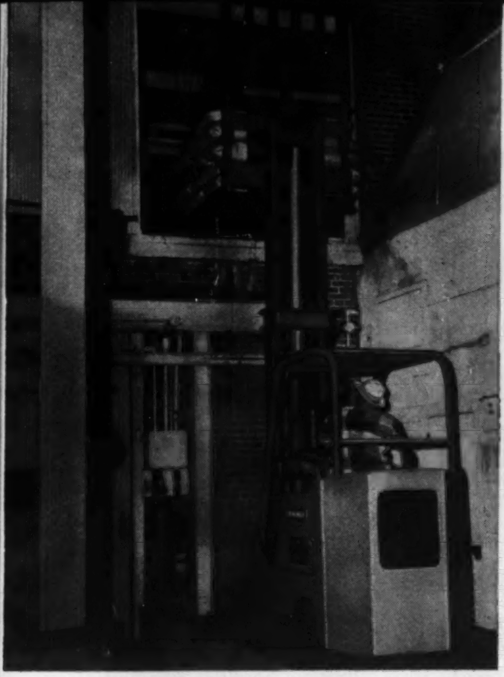




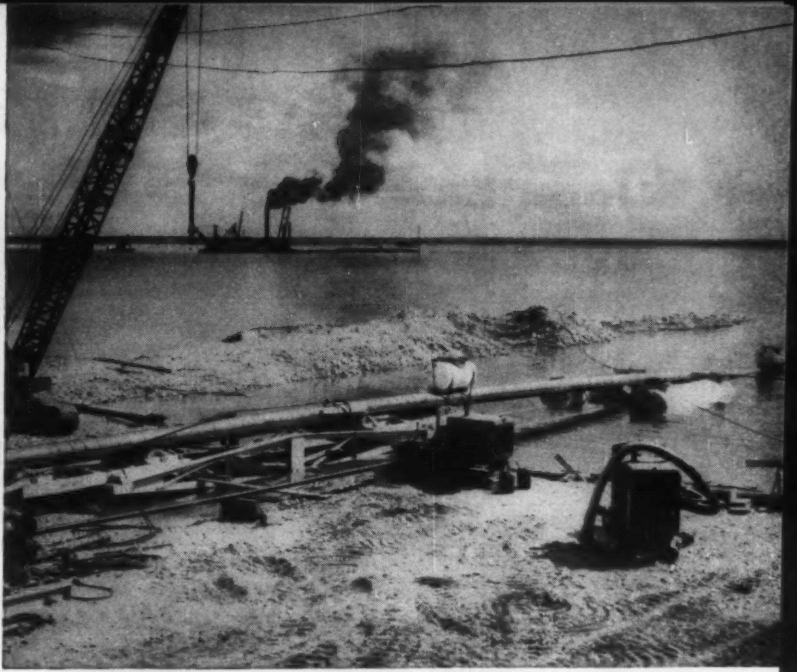
THE WAVE GUIDE TUBE of this radar scanner designed by Davis Industries, Detroit, Michigan, is manufactured from National Seamless Tubes of USS Stainless Steel. It will not corrode, needs no plating, and meets perfectly the required weight and strength factors.

BACKBONE OF A NATIONAL

THE NATIONAL SEAMLESS METHOD of manufacture is one of the most difficult forging operations in the steel industry. A billet of the finest steel is actually pierced to produce a seamless tube with absolutely uniform wall strength. No welds . . . no joints . . . no weaknesses.



THE TOWMOTOR LIFT TRUCK features a standard mast with one of the highest free lifts in the industry—25½ inches. Key to this powerful action is the hydraulic hoist cylinder of rugged, shock-absorbent National Seamless Mechanical Tubing – the "muscle" that puts the lift into every load hoisted.



THE WORLD'S DEEPEST AND LONGEST Submarine Pipeline Crossing was at the Straits of Mackinac—four miles wide and 250-feet deep. National Seamless Pipe, 20 inches in diameter, was welded into 2,500-foot-long sections for the big pull.

HUNDRED INDUSTRIES...

Seamless Pipe and Tubes

In every type of application—from the intricate heating and air conditioning system of a new skyscraper to the chattering, blazing machine guns of a jet fighter—you'll find USS NATIONAL Seamless Pipe and Tubes.

NATIONAL Seamless combines to the highest degree the desirable qualities of strength, safety and workability. Uniform throughout and dimensionally accurate, NATIONAL Seamless Pipe and Tubes machine cleanly, weld readily, and promise smooth installation and long satisfactory service. National Seamless Tubes are available in a complete range of steel analyses, wall thicknesses and diameters, every foot produced to exacting standards by the world's largest manufacturer of tubular steel products.

Bring your pipe and tubing problems to National Tube. Regardless of the application, our engineers are interested in discussing the problem with you.

NATIONAL TUBE DIVISION, UNITED STATES STEEL CORPORATION, PITTSBURGH, PA.

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS UNITED STATES STEEL EXPORT COMPANY, NEW YORK

SEE The United States Steel Hour. It's a full-hour TV program presented every other week by United States Steel. Consult your local newspaper for time and station.

USS

National Seamless Pipe and Tubes

WALLS WITHOUT WELDS

UNITED STATES STEEL

looking for the right tube in WELDED STAINLESS?

Check Standard's Complete Range of tube and pipe sizes!

Whether it's for a pressure, mechanical, sanitary or ornamental use — Standard offers you a convenient "one source" answer to your welded Stainless Steel Tubing need.

TUBE SIZES: ¼" to 4" OD .025 to .148

PIPE SIZES: ⅛" to 2" IPS Schedule 40

TYPES: 430, 302, 304, 309, 316, 321, 347; and others including low-carbon grades.

SHAPES: Squares, Rectangles and Special Shapes

PIPE SIZES: ⅛" to 4" IPS Schedules 5 & 10

Send for Stainless Folder! Our engineers will gladly assist you in your selection of the tube best suited to your needs! Write today!

Specify Standard for

- WELDED STAINLESS TUBING AND PIPE
- WELDED CARBON STEEL MECHANICAL TUBING
- BOILER AND HEAT EXCHANGER TUBING
- EXCLUSIVE "RIGIDIZED" PATTERNS

THE STANDARD TUBE CO.
Detroit 28, Michigan
Welded Tubing · Fabricated Parts

(*Continued from page 79*)

nium processing mill at Monticello, Utah. The company also is the contract operator of the AEC's feed materials production center in Fernald, O., and the ore testing pilot plant in Grand Junction, Colo.

Jack & Heintz Expands

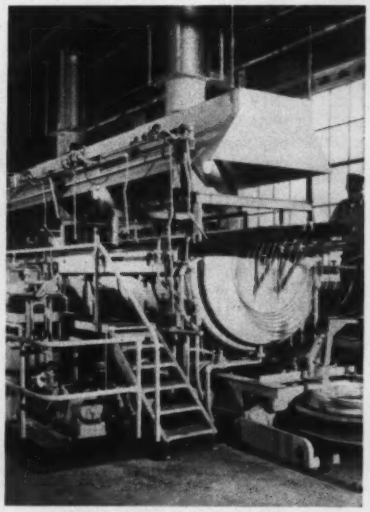
Jack & Heintz Inc., Cleveland, purchased two plants to house an integrated research and development center for aircraft and missile electric power systems. Floor area is more than 135,000 sq ft.

Carbide Plant Converted

State Metals & Steel Co., Canton, O., purchased National Carbide Corp.'s plant in Ashtabula, O., for $420,000 and will convert it into a foundry.

Buys Power Loader Firm

L. A. Young Spring & Wire Corp., Detroit, purchased the assets of the Woodside Power Loader Division of Woodside Industries, Milwaukee, for $500,000. Manufacturing operations will be transferred to the company's Daybrook Hydraulic Division in Bowling Green and Upper Sandusky, O. Daybrook will produce Woodside



Electrolytic Plater Installed

Stainless steel wire is copper plated by a new electrolytic machine installed recently at Republic Steel Corp.'s Union Drawn Steel Division, Massillon, O. The machine plates wire in diameters from 3/16 to ⅝-in. Exit end is shown

Rollway Maximum Bearings are used in the McDonnell Voodoo Jet

Bearings of the Future for Machines of Today

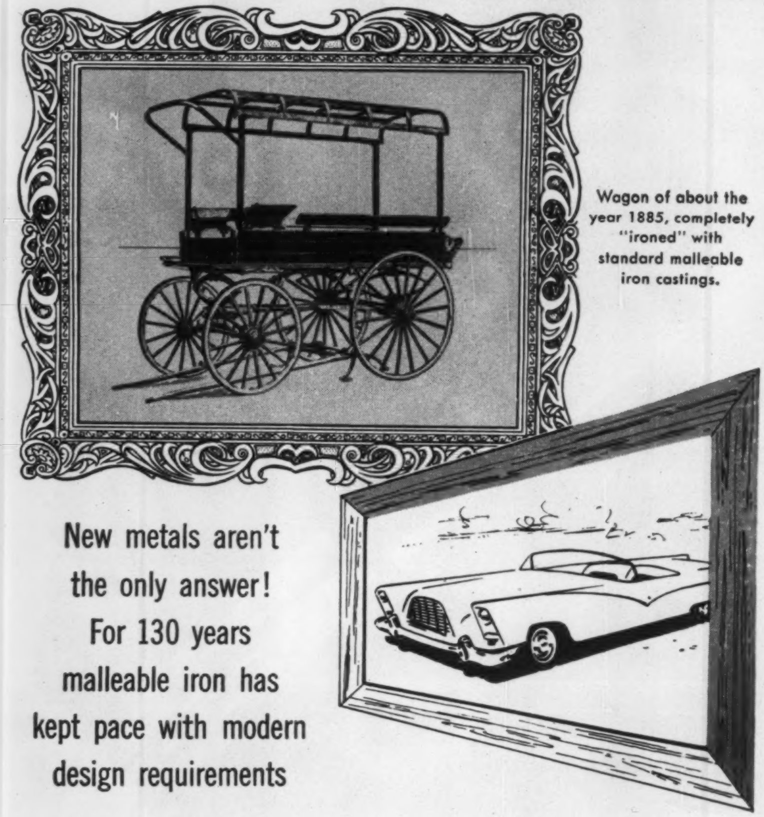
Gunned by higher speeds and higher temperatures, the performance demand for anti-friction bearings rises sharply every year. Here at Rollway, we strive always to keep abreast of the trend, and even to anticipate it. In precision, dimensional stability and simplicity, Rollway Maximum Bearings offer performance based on advanced thinking to original equipment and replacement buyers of today.

Start now, up-grade both your production machinery and your products with Rollway *bearings of the future.* Rollway Bearing Company, Inc., Syracuse 4, N. Y. Manufacturers of a complete line of radial and thrust cylindrical roller bearings.

ROLLWAY
Maximum
ROLLER BEARINGS

ENGINEERING OFFICES: SYRACUSE • BOSTON • CHICAGO • DETROIT • TORONTO • PITTSBURGH • CLEVELAND • MILWAUKEE • SEATTLE • HOUSTON • PHILADELPHIA • LOS ANGELES • SAN FRANCISCO

How about
Malleable?



Wagon of about the year 1885, completely "ironed" with standard malleable iron castings.

New metals aren't the only answer! For 130 years malleable iron has kept pace with modern design requirements

Malleable proved its worth long ago in parts requiring toughness, ductility and resistance to shock. Through years of processing refinements, today's malleable iron is a superior metal, adaptable to meet job demands—ties in with modern-age requirements.

Versatile castability, high ratio of yield point to ultimate strength, and remarkable ease of machining mark malleable for new uses every day. And still further advancements in malleable and pearlitic malleable production assure higher capacity to serve new users whose forward planning and design awareness recognize the many advantages of this "old-new" material.

It's worth your while to take malleable iron castings into consideration when designing new products or when seeking new cost and assembly savings. Consult your nearest malleable foundry, or write to this Society for information.

Malleable
FOUNDERS' SOCIETY

1800 Union Commerce Building
Cleveland 14, Ohio

hydraulic power loaders, grapples and pallets in addition to its line of steel dump truck bodies, hydraulic hoists and power tail gates for both farm and commercial vehicles.

Aircraft Company Forms

A new company, Clemco Aero Products Inc., will move into a new 75,000-sq-ft plant at 210 E. Manville St., Compton, Calif. The firm will machine missile fins and structural sections of aircraft, mill aircraft wing skins and produce quick disconnect fittings for aircraft and missile pneumatic lines. John D. Taylor, Buffalo industrialist, is president.

REPRESENTATIVES

George Scherr Optical Tools Inc. named Techneering Sales Inc., 53 Park Ave., Dayton, O., as exclusive representatives in southwestern Ohio for sales and engineering service on the Scherr line of inspection and measuring tools and equipment.

L. J. Wing Mfg. Co., Linden, N. J., announced the appointment of three sales representatives for the company's line of revolving unit heaters, fans, blowers, draft inducers and steam turbines. Power & Combustion Inc., Baltimore, will handle Maryland sales; the Gulf-South Engineering Co., Birmingham, will cover the northern and central Alabama territory; and Bell & Co., Mobile, Ala., is in charge of the southern Alabama area.

Taft-Peirce Mfg. Co., Woonsocket, R. I., announces that Machine Tool Sales Co., Dallas, a division of Tool Supply & Engineering Co., will handle sales of Taft-Peirce machine tools in the Dallas area, beginning May 1.

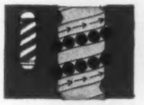
Buckeye Tools Corp., Dayton, O., manufacturers of drilling, fastening, abrasive and special tools and accessories in air and high-frequency electric types, appointed Abrasive Machine Methods Corp.,

HOW MANY POSITIONING PROBLEMS CAN THESE AMAZING UNITS SOLVE FOR YOU?

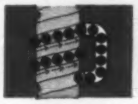
Frankly, we don't know. Almost daily we hear of some new application that never occurred to us. But we do know this: electronics engineers are achieving the "impossible" with Saginaw ball/bearing Screws and Splines, particularly these miniature sizes, from 1½ to 3 inches long.

CHECK THESE UNPRECEDENTED PERFORMANCE ADVANTAGES:

Saginaw ball/bearing SCREWS



Nut *glides* on steel balls. Like stripes on a barber pole, the balls travel toward end of nut through spiral "tunnel" formed by concave threads in both screw and mating nut.



At end of trip, one or more tubular guides lead balls diagonally back across outside of nut to starting point, forming closed circuit through which balls recirculate.

UP TO 5 TIMES MORE EFFICIENT

Up to 95% efficiency guaranteed in transforming rotary to linear motion; over 80% efficiency, linear to rotary. Require less than 1/5 as much torque as conventional Acme screws for equal output.

SAVE SPACE, WEIGHT, POWER

Permit much smaller, lighter motors and auxiliary equipment. Saginaw b/b Screws have been built from 1½ inches to 39½ feet in length.

PRECISE POSITIONING AND SYNCHRONIZING

Machine-ground types provide precision control within fractional thousandths of an inch, plus perfect synchronization of two or more movements.

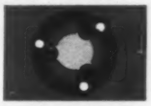
OPERATE IN VERY ADVERSE ENVIRONMENTS

Saginaw b/b Screws have been designed and built to operate from −75° to +900° F. Even if lubrication fails or cannot be originally provided, they will still function with remarkable efficiency.

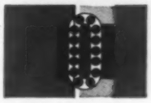
LONG, DEPENDABLE SERVICE LIFE

Accurately predictable life engineered to design requirements. Special Gothic arch groove design and multiple circuits assure dependable performance.

Saginaw ball/bearing SPLINES



The *Saginaw b/b Spline* radically increases the efficiency of transmitting or restraining high torque loads. Instead of *sliding* against each other, the mating surfaces *glide* on rolling balls.



The steel balls recirculate in closed circuits formed by mating longitudinal raceways spaced around the circumference of both inner and outer splines. Guides return balls to starting point.

40 TIMES LOWER FRICTION COEFFICIENT THAN ORDINARY SLIDING SPLINES

By applying the same basic gliding ball principle pioneered by Saginaw in the ball/bearing screw, this revolutionary new kind of spline makes practical new engineering designs never before possible.

TRANSMIT OR RESTRAIN HIGH TORQUE LOADS FAR MORE EFFICIENTLY

In any application where column length must change under torque load, the Saginaw b/b Spline offers unprecedented freedom from sliding spline restrictions.

WIDE CHOICE OF ATTACHMENTS

Can be fitted with integral gears, clutch dogs, bearing and sprocket seats or other attachments for use with electric, hydraulic or pneumatic units.

WIDE RANGE OF SIZES AND TYPES

Saginaw b/b Splines have been designed from 3 inches to 9 feet in length, and from ⅜ to 3¾ inches in diameter. To convert push-pull to rotary motion, helical types are available with very high leads, ranging from 20:1 to 100:1.

MAIL COUPON TODAY FOR NEW ENGINEERING DATA BOOK

Saginaw Steering Gear Division
Ball Bearing Screw & Spline Operation
General Motors Corporation
Dept. 4N, Saginaw, Michigan
Please send your Engineering Data Book to:

Name—Title____________________

Firm____________________

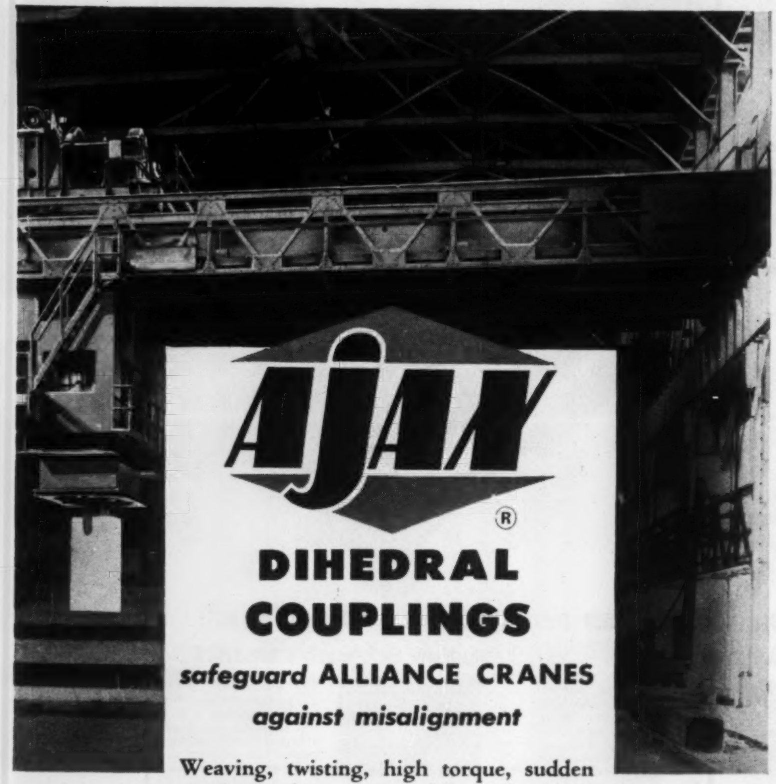
Address____________________

City__________ Zone_____ State______

Saginaw

ball/bearing

Screws & Splines



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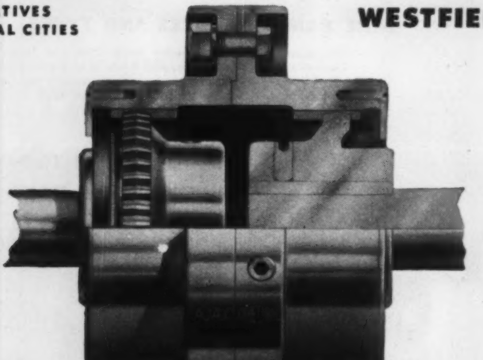

Cutaway shows Ajax patented DIHEDRAL tooth design and location of oil seals.

Cleveland, as its northeastern Ohio representative. Ammco will offer sales and service to portable tool users in the Cleveland-Akron-Canton industrial area.

Wendt-Sonis Co., Hannibal, Mo., and Rogers, Ark., was appointed by **American Lava Corp.**, Chattanooga, Tenn., as sales outlet for its Alsimag ceramic tips for metal-cutting tools.

William E. Whitehouse, formerly of Kaiser Steel Corp., is sales representative in Denver for Laclede-Christy Division, **H. K. Porter Company Inc.**, St. Louis. Mr. Whitehouse's sales territory will cover New Mexico, Colorado, Nevada, Utah, Wyoming and Idaho.

ASSOCIATIONS

The Benjamin Garver Lamme Medal was awarded to Dr. Clinton R. Hanna, associate director of Westinghouse Research Laboratories, by the **American Institute of Electrical Engineers.** The gold medal, established by the will of Mr. Lamme, former chief engineer at Westinghouse, is presented annually for outstanding accomplishment in the development of electrical apparatus or machinery. Dr. Hanna was selected for his fundamental calculations and developments in electrodynamics and his achievements in the design of voltage regulators, automatic rolling mill controls and tank gun stabilizers.

NEW ADDRESSES

Harvey Aluminum, Torrance, Calif., moved its Bay area engineering offices to 2020 Milvia St., Berkeley 4, Calif.

Garrett Corp., Los Angeles, producer of aircraft components and accessories, moved the Ardmore, Pa., office of its Aero Engineering Division to Paoli, Pa. The new facility includes approximately 3200 ft of warehouse and office space.

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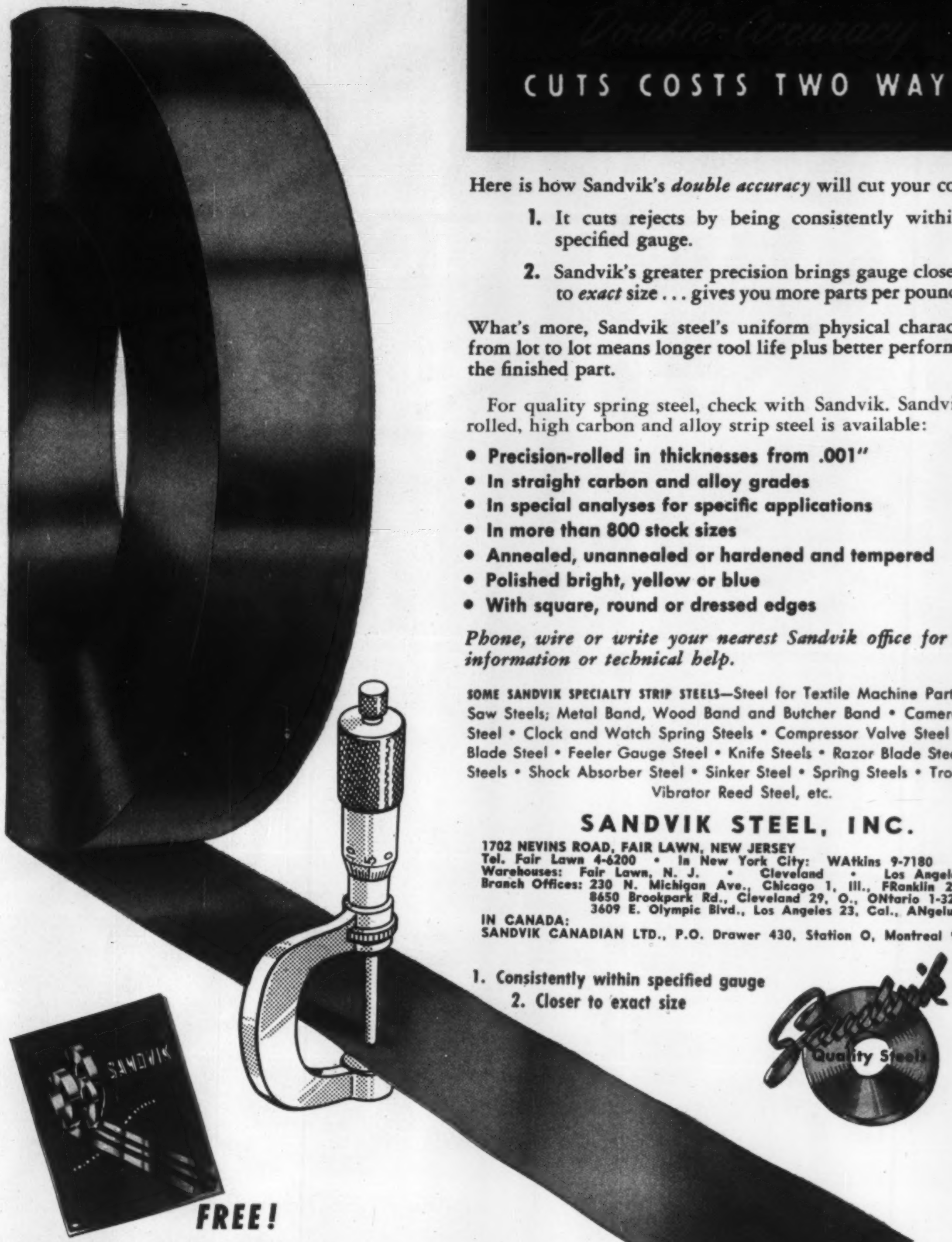

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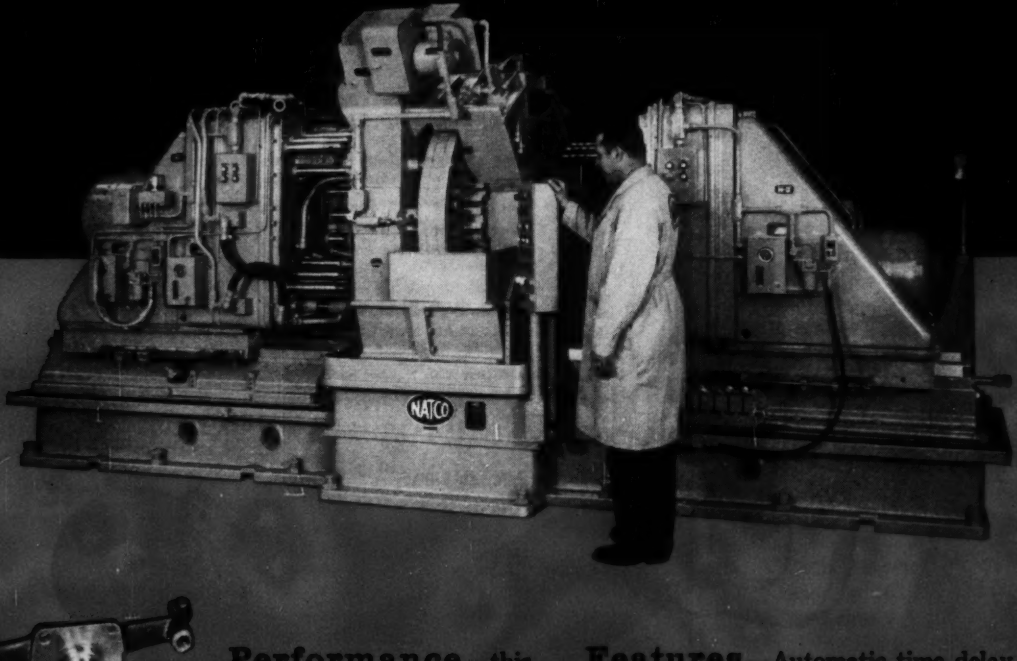
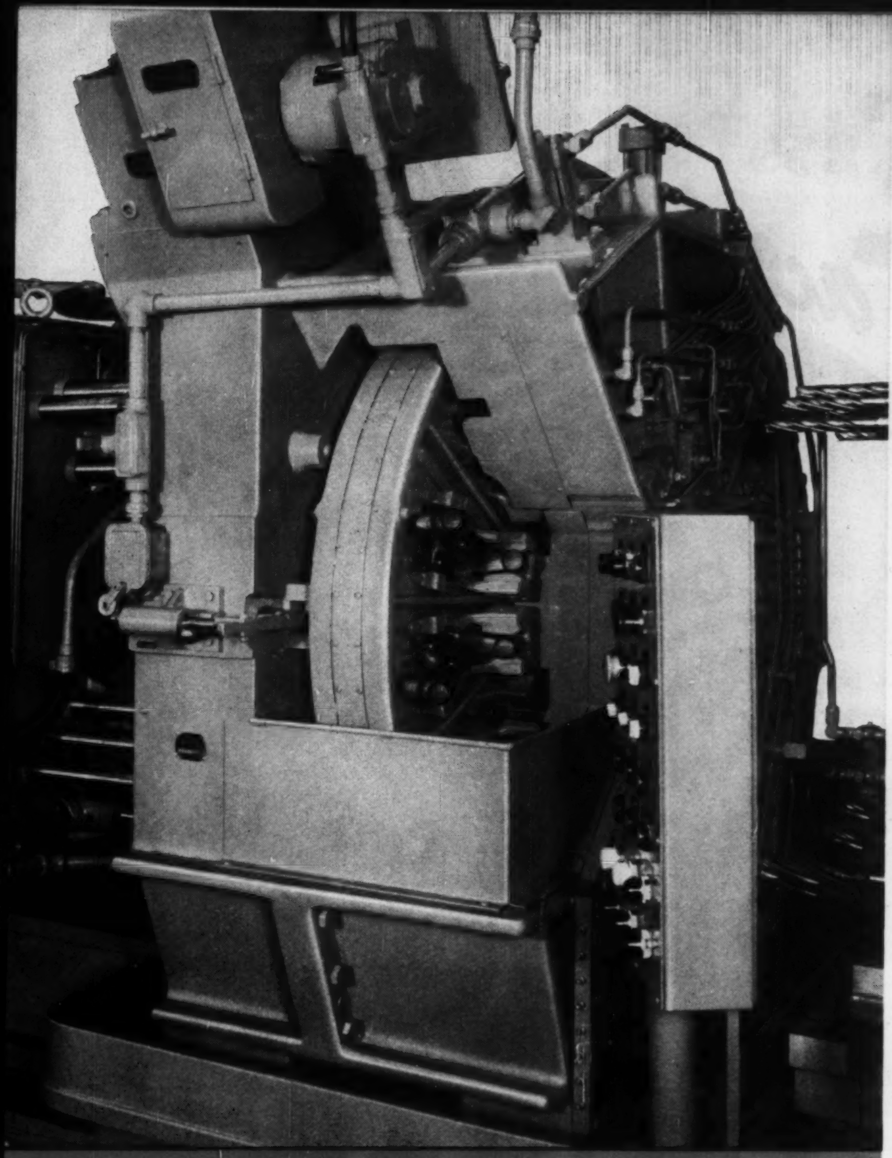


Performance—this Natco 2-way horizontal drilling machine produces 250 steering knuckles per hour. Holds limits as close as .004″. Parts are clamped automatically in the interlocked trunnion fixture—spot-drilled, drilled, spotfaced, reamed and counterbored.

Features—Automatic time delay reverse, positive stop, coolant system with magnetic chip separator, automatic lubrication to heads and ways, hydraulic feed and J. I. C. compliance. Let a Natco field engineer help you with your drilling, boring, facing and tapping problems.

Ask for information about the PAYD (Pay-As-You-Depreciate) finance plan.



Notes from Natco…

Whole Hog or Piecemeal

Seems like two distinct approaches are being taken in the adoption of automatic assembly methods. The "whole hog" school favors abrupt change . . . wait until you can install a machine that will handle the *complete* assembly job. The "piecemeal" school favors a step-by-step transition, starting with the basic transfer mechanism and adding automatic stations one or two at a time.

Variety Show

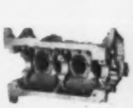
The critics say you can't have high production and versatility, too. But one of our eastern customers has run his drilling show that way for years. On seven adjustable multispindle Natcos, he drills and taps over 1000 different parts in lots from 50 to 10,000.

Shuttle for Speed

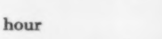
Like the Three Musketeers, drilling, chamfering and tapping go together. Natco is now building sliding tables for their small standard machines allowing all three operations with one push of the button. Starting in drilling position, table automatically indexes for chamfering and tapping; then returns. Up to 24 operations at a crack.

Processed by Natco Machines

Part: Gear Housing
Machine: Natco vertical Holesteel
Operations: Drill 11 holes; Counterbore 1 hole; Chamfer 3 holes; End cut ream 1 hole; Combination ream, face and chamfer 1 hole; Ream 3 holes.
Production: 90 per hour



Part: Cylinder Block
Machine: Natco Holesteel
Operations: Drill 17 holes in 4-cylinder block or 23 holes in 6-cylinder block.
Production: 40 parts per hour



Part: Shaft
Machine: Natco H-5
Operations: Combination drill and chamfer 3 holes; Drill 4 holes.
Production: 80 parts per hour

NATIONAL AUTOMATIC TOOL COMPANY, INC.
Richmond, Indiana

Multiple-spindle drilling, boring, facing and tapping machines
Special machines for automatic production

NATCO

Call Natco offices in Chicago, Detroit, Buffalo, New York, Boston, Philadelphia, Cleveland and Los Angeles; distributors in other cities.

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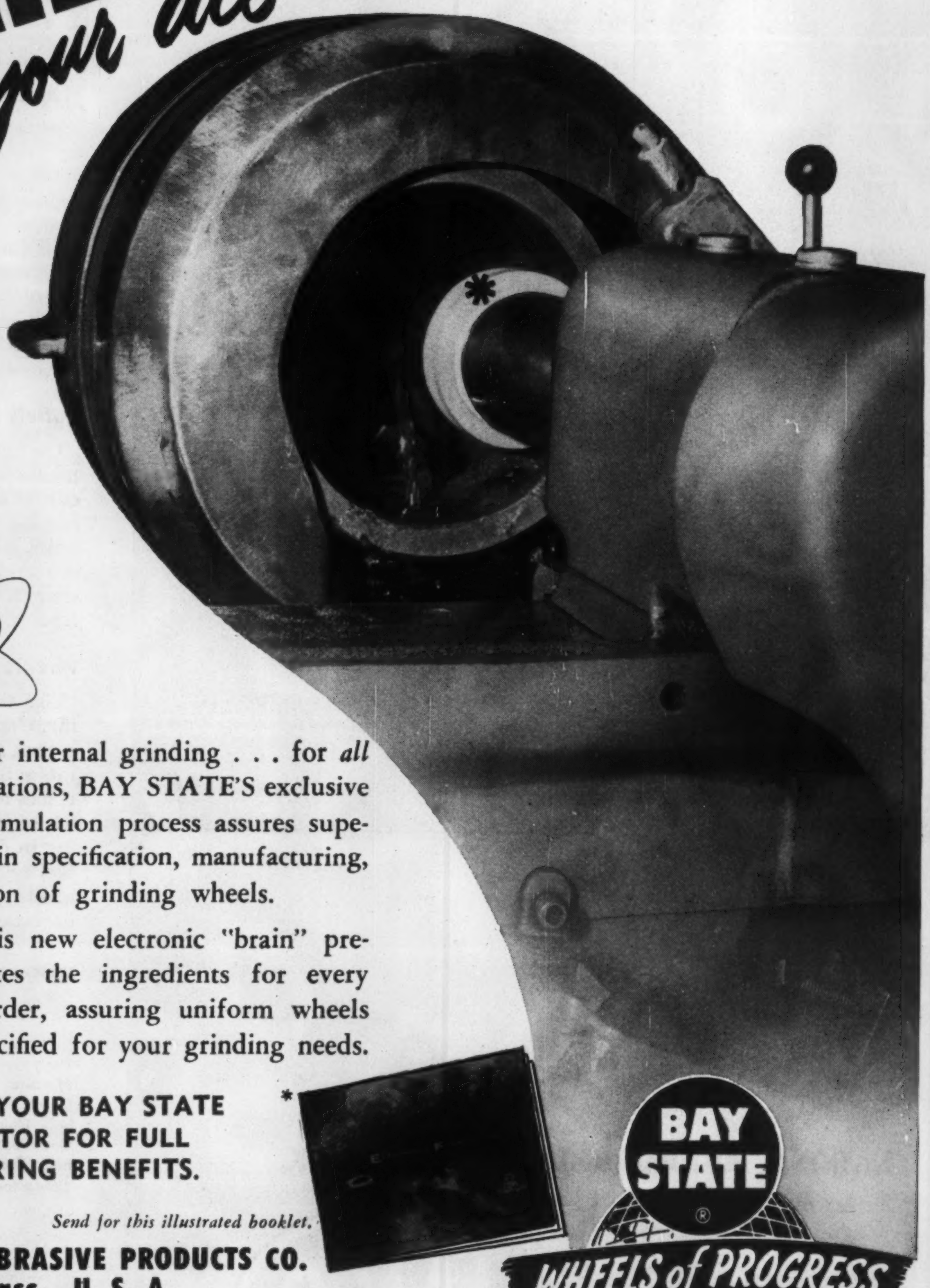

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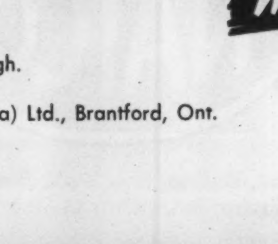

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STEEL

April 16, 1956

Technical Outlook

NEED STRONGER BRASS PARTS? — New Jersey Zinc Co.'s research department reported at the Metal Powder Association meeting in Cleveland last week that it has developed a new brass powder which contains nickel and phosphorus or iron nickel and phosphorus. The gain in strength and hardness brings brass powder metallurgy parts more closely in line with the properties of wrought metal parts. Normal compacting and sintering methods are used. The company is seeking applications where the improved properties can be evaluated.

TI-MOLY BOOST— Although difficult to alloy, molybdenum is one of the best possible elements to combine with titanium. The alloys are ductile, tough, heat treatable and are sluggish to beta reaction, state Battelle Memorial Institute scientists. Molybdenum helps the development of uniform elongation and toughness under conditions where the beta phase turns to martensite during cold working.

CARBIDE DIES— Although they cost 2½-times more, the latest carbide dies last ten times longer than comparable steel dies. Don't consider changing unless you run parts by the millions; carbide may outlast the job.

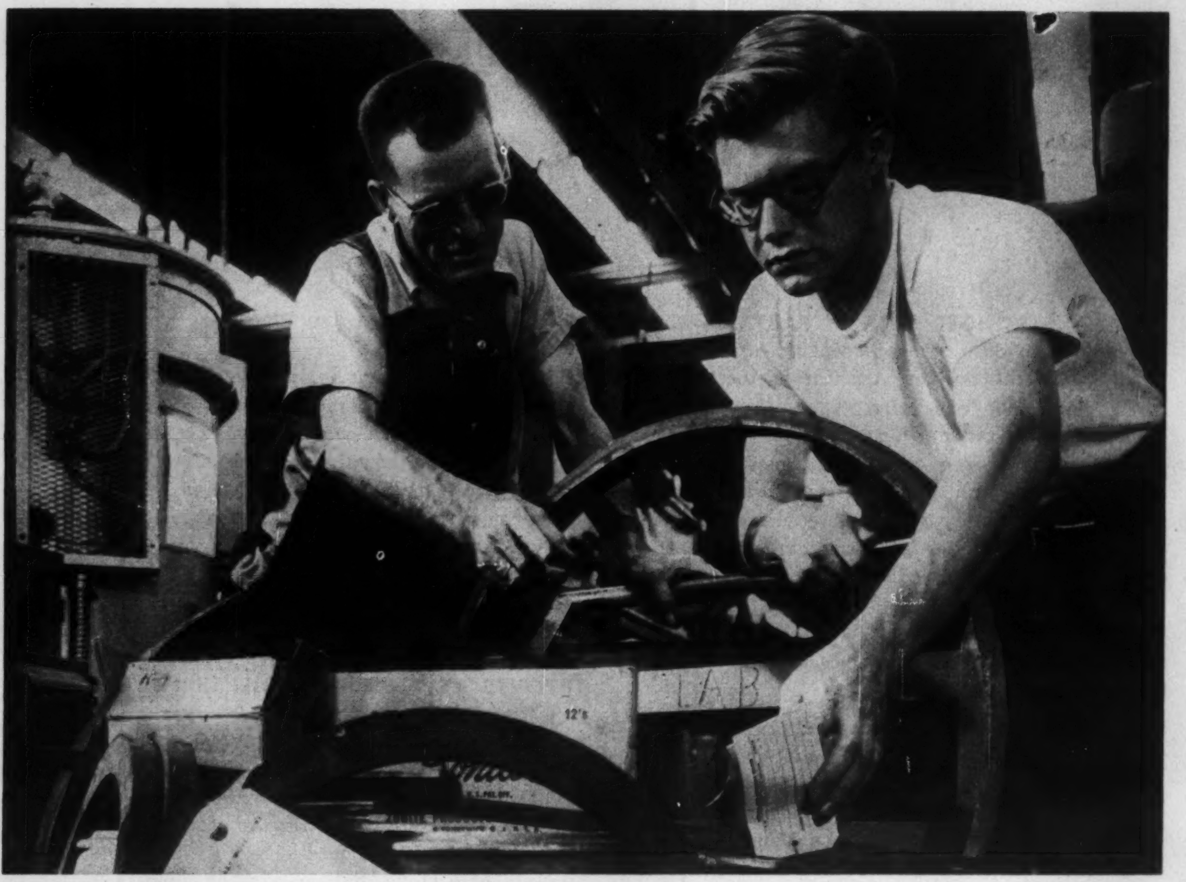
HEAT-TREATABLE TI— The production airplane that will travel at 1600 mph isn't far off, predicts Convair. Skin temperatures will be too high for any aluminum alloy, so manufacturers will turn to heat treatable titanium now being developed.

CARBIDE FROM A TUBE— Reed Roller Bit Co., Houston, hard faces many of its rock bit teeth with tungsten carbide. The carbide powder is packed in 1/8 to 5/16-in. steel tubing. The tubes, roughly 18 in. long, are crimped every inch or so to keep the powder from falling out. An operator holds one end of the tube on the tooth to be coated. Applying a torch, he melts the steel tube (which serves as a binder), and the carbide powder falls onto the tooth surface. Reed makes its own tungsten carbide, buys from 5 to 6 tons of tungsten a month for this purpose.

TRYOUTS AT 90 BELOW— Oil that's like glue, gasoline that won't ignite, fully charged batteries that are sluggish, antifreeze that has to be warmed . . . those are some of the problems the University of Wisconsin will solve in its new, low temperature, research laboratory. Customers are the U.S. armed services; first problem will be a stove that operates on almost all liquid fuels, keeps burning in a 40 mph wind.

NITROGEN HELPS— Melting and casting chrome-manganese austenitic steel in a 150-psi nitrogen atmosphere greatly improves performance at room and elevated temperatures. Working jointly, Ford and Armour Research Foundation get ½-per cent or more nitrogen into the steel and reduce the amount of nickel needed.

SHELL MOLDING IN DIXIE— The South is giving shell molders an encouraging look, according to the Shallway Corp., Connellsville, Pa. It's setting up a company to distribute supplies to southern founders . . . estimates that by the end of this year 80 per cent of the castings used in textile machinery and irrigation pipe fittings will be shell molded.



In specification work quality control is a must. Here is an assortment of parts to be tested in Solar's laboratory

What Specifications Mean to You

By HIRAM BROWN
Company Chief Metallurgist
Solar Aircraft Co.
Des Moines, Iowa

WITH NEW accent on diversification and "second sourcing" for government work, there are many companies that will become sub or subsubcontractors for prime contractors.

Much of the work may be on jets, gas turbines, guided missiles or ordnance. If you are new to the field of government work, you will be confronted with specifications which may be new, strict and sometimes bewildering.

Why — The first question you may ask is: "Why must so many specifications be imposed?" The reason is simple. Since the prime contractor is responsible for the quality and performance of the product he supplies, he wants to be as sure as possible that the required quality will be maintained.

Since almost every shop would do certain operations differently, rigid specifications are imposed to establish uniformity. They also are a means of giving all bidders the same standards, so that low bidding cannot be done on the basis of lower quality or elimination of certain operations.

What—Specifications may cover anything from raw materials to shop processes. In this article, most of the specific references to material or process specifications will be confined to those that relate to metals. The same principles and considerations apply equally to those concerning nonmetallic materials.

The prospective subcontractor

should not pass over specifications lightly. Unless they are carefully read and understood, they can lead to high rejection rates, monetary loss or loss of confidence by the customer. Remember, once you accept the specifications you will be held to them.

Types—Specifications can sneak up on you in several ways. They can be in blueprints or purchase orders. Purchase orders may cite certain exceptions to normal specifications. Engineering changes may be issued to supplement or supersede blueprint requirements. See the checklist on this page for precautions you should take.

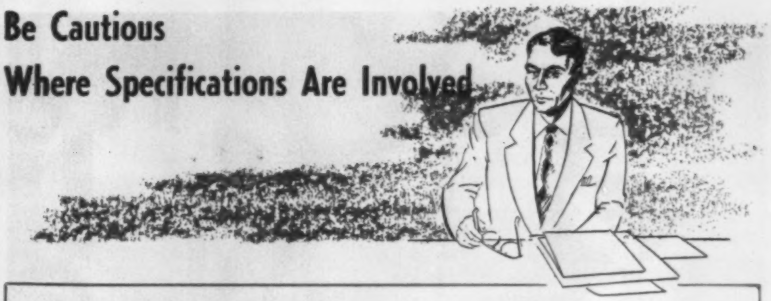
Several types of specifications may be encountered. Among the more common are: 1. Customer's specifications. If Snafu Inc. is placing an order, it may refer to specification S1142, etc. 2. AMS (Aeronautic Material Specifications). They are always prefaced by the initials AMS, such as AMS 5613. 3. Federal specifications, such as QQ-S-763, or more recent military specifications, such as MIL-S-7720.

In Ordering—Where such specifications are referred to, it is wise to order raw material to those specifications and not by type, such as 310, 8630, silver solder. There is usually a slightly higher cost for material purchased to a specification, but quality is better. To order by tradename is to permit shipment of commercial material which may not meet the customer's requirements.

Since all quoters are expected to use the same quality material, there should be no price differential. Anyone who buys commercial material because it is cheaper may lose more than he saves owing to quality rejections in his shop or at the customer's shop. Charges can be made for extra quality or processes—such as heat treatment—if they are required in the specifications.

Meaning — Of the various specifications available, the AMS are among the most popular and easy to understand. Each specification for metals includes only one type material. When you order AMS 5645, this always refers to Type 321 stainless; AMS 2400 refers only to cadmium plating, etc. Different forms of the same material are not included in the same speci-

Be Cautious Where Specifications Are Involved



Here are ten precautions

1. When a request to quote on a job is received, carefully examine the request or purchase order—front and back. Study any supplied blueprints to determine what specifications are referenced and what requirements will be imposed on the vendor

2. Recognize that the customer can hold you to those specifications. He can—and probably will—reject all parts which do not meet them. This is high quality work and the customer is willing to pay for what he wants—but he expects to get what he specifies

3. Get copies of the specifications involved. The customer usually will be glad to furnish copies of company specifications. After all, he isn't trying to booby trap you

4. Analyze the specifications carefully. This may require good technical assistance (and, as a matter of fact, the proverbial Philadelphia lawyer might be most welcome in some cases)

5. Check your facilities to see that all required operations can be performed in your shop, or that space and money are available to install the necessary facilities. You may be familiar with some shop to which you can subcontract portions of the work which you are not equipped to do. If bolts and nuts are required, you may want to locate a shop with screw machines or thread rollers, or if cadmium or silver-plated parts are required, you might want to locate a good plating shop

6. If there is anything questionable in the specifications, get immediate clarification from the customer

7. If any of the requirements are unsuitable to your shop, or if they seem unnecessarily restrictive, you may voice exception and state your reasons and any suggested alternatives. There are many processes which can be done in more than one way to obtain the end result required. The customer would rather have you discuss these things prior to acceptance of the order than to have later delays in adjusting and arbitrating these matters. Also, they may affect price, delivery and customer relations

8. After you have considered the foregoing questions, decide whether you really want to tackle such high quality work, or whether, frankly, it's over your head

9. If you decide to quote, and receive the order, check or establish quality control procedures and personnel to assure that material purchased—and parts shipped—will meet the imposed requirements. Good quality control is a must. You will be surveyed and rated for this and you must meet with approval

10. If any discrepancies or difficulties are encountered, notify the customer before he receives bad parts or is under pressure because of delayed delivery. You will find most customers quite helpful if advice or assistance is needed during the starting-up period, provided he is contacted before he receives questionable merchandise at his shop. He may not be so co-operative if the matters must be discussed after you have delivered unsatisfactory or tardy parts. To paraphrase a current saying: "He may not always be right, but he's always the customer"

X-ray testing assures the high quality specifications demand

fication. Here's an example:

Stainless Type	Form	AMS No.
347	Sheet, strip	5512
347	Bars, forgings	5646
347	Seamless tubing	5571
347	Welded tubing	5575
347	Investment castings	5362
347	Sand castings	5363

Not all specifications are that simple. For example, QQ-S-763a contains ten different classes of steel:

Class	Description
1	18% Cr, 8% Ni
2	8 % Cr, 18% Ni (0.050% C max)
3	13% Cr (0.15% C max)
4	17% Cr (0.15% C max)
5	13% Cr (hardening) (0.40% C max)
6	12% Cr (free machining) (0.15% C max)
7	18% Cr, 8% Ni (free machining) (0.12% C max)
8	18% Cr, 8% Ni (Ti or Cb stabilized) (0.10% C max)
9	18% Cr, 8% Ni, 2% Mo (0.10% C max)
10	17% Cr, 1% C

Those ten materials can be in any one of six conditions:

Type	Description
A	Annealed (0.08% C max)
B	Hot-worked (0.12% C max)
C	Annealed and cold-worked (0.12% C max)
D	Annealed (0.12% C max)
E	Tempered
F	Hardened

If annealed Type 410 stainless bars are wanted, the proper designation would be QQ-S-763a, Class 3, Type A. (Comparable material would be AMS 5613-annealed.)

Physical Properties — Not only must the chemical composition be checked against Table 1 of the specification, but physical properties must be checked against a complex Table II, which includes class, type and diameter or thickness. Imagine the confusion that would exist if reference were made to QQ-S-763a without class or type. With such specifications, you must be sure that class and type are included; you can't afford to guess which alloy the customer had in mind. The same precaution exists when you're passing such specifications along to your subcontractors.

Complex — Other specifications, such as MIL-S-7720, have composition, physical condition and surface condition requirements:

Materials Included in Specification
302 Stainless
316 Stainless
303 Stainless (sulphur)
303 Stainless (phosphorus)
303 Stainless (selenium)

Physical Conditions

A	Heat-treated (annealed, etc.)
B	Cold finished
C	Hot rolled or forged only

Surface Conditions

a	Scale not removed (hot finished)
b	Pickled or blast cleaned
c	Cold drawn
d	Cold rolled
e	Turned
f	Centerless ground
g	Polished

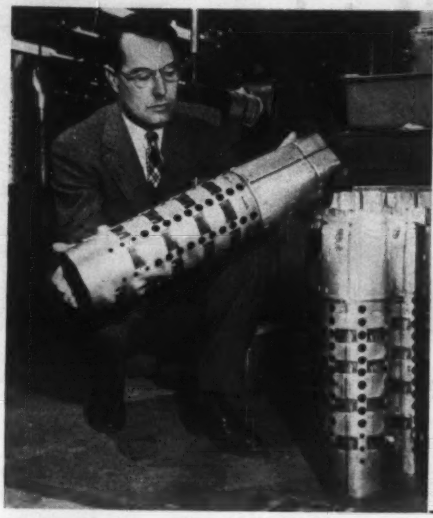
If 302 stainless bars, annealed and pickled, are desired, the proper designation would be MIL-S-7720, composition 302, physical condition A, surface condition b. (For AMS, this same material would be designated AMS 5639.) Here, again, care must be taken to see that complete specification reference is given or received.

If you are allowed any control over the specifications, you may be able to use the simpler ones, such as AMS. Often, specifications such as AMS are permitted as options to the designated specifications. It is a good idea to check with the customer when complicated specifications are submitted to see whether common, simpler ones can be used without affecting end use.

Interpret — Certain phrases in specifications should be understood. Finding out what is required, what is optional or what is necessary only part of the time may hinge on the correct interpretation. In AMS specifications, for example, consider these statements:

1. "Material shall conform to the following requirements." This means you always must test for those properties, and they must fall within specification limits.

2. "Parts shall be subject to x-ray examination." This does not mean that you must x-ray 100 per cent of the parts. However, if the



MEET THE AUTHOR

No stranger to STEEL's readers (see "Carbides in 310 Stainless Steel, Parts 1 and 2," July 19 and July 26, 1954), "Hi" Brown has written many technical articles. His book, *Aluminum and Its Applications,* was published in 1948. Before joining Solar in 1946, he was plant manager for Aluminum Industries, Cincinnati. Other posts: Chief metallurgist of Frontier Bronze Corp., Niagara Falls, N. Y., and foundry metallurgist at the Detroit plant of the Aluminum Co. of America. While at Frontier Bronze Corp., he perfected the aluminum alloy 40E. At Solar, he works on fabrication of stainless steel and high-temperature alloys for jet engine, gas turbine and other aircraft parts. Specifications are nothing new to him.

customer x-rays any and finds defects, the parts may be rejected. You must do enough x-ray examination to satisfy yourself that quality will be maintained. Some assemblies or parts may require a higher percentage of checking than others, particularly when production is in its early stages.

3. "Material shall be capable of meeting the following requirements." This means that numerous tests have shown that sound material of the composition and condition listed should consistently meet those requirements. You need make only enough tests to satisfy yourself that this is true. If the customer requires that you impose those tests on every heat, then it is an addition to the specification and you may charge accordingly.

Those examples show the necessity of understanding specifications. Failure to test when it is required can get you into trouble; 100-percent checking where it is not required can cost a lot of money.

Deviations—Although specifications normally are adhered to closely, there are cases where deviations may be granted by the customer. For example, if the maximum allowable chromium is 18 per cent and your analysis shows 18.15 per cent, this may not noticeably affect the performance of the material. Similarly, if a minimum elongation of 40 per cent is specified and your test shows 39 per cent, this may be considered inconsequential.

Although it is not good practice to run to the customer constantly with material outside of specification, there are cases, such as those above, where he should be consulted before you reject large heats or batches of material.

Approval—Keep in mind that approval of a certain material for minor discrepancies does not establish precedent, and the customer reserves the right to discontinue granting deviations. This may come because it is found that the deviation is affecting properties or performance. Or the customer may conclude that you have not tried hard to locate material within the specification and have accepted anything shipped to you.

Substitution of a similar or equivalent material for the one specified is not permitted except by limited and specific approval from the customer. It is not wise to second guess. While 8630 and 4130 types of steel may be almost automatically interchangeable, you might get into serious difficulty with the customer by using 321 in place of specified 347—even though these grades of stainless might seem to you to be more nearly alike than are 8630 and 4130.

Remember, all technical people do not agree on the equality of certain alloys. Don't assume too much. Each substitution should be referred to the customer, unless blanket permission for options is given.

Spot Checking — In many cases, statistical quality control spot checking of residual chemical elements may be permitted. For example, so seldom is high phosphorus, sulphur or copper found in aircraft quality steel that spot checking of only one out of 10, 50 or 100 heats is really necessary. The same thing may be true with residuals of other types or in other metals. Don't overlook these chances to save time and money, but be sure to get permission from the customer before you launch such a program.

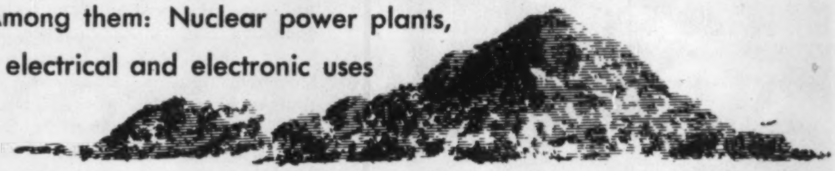
Willing Assist — Specifications are not just a lot of paper work to be passed over lightly. To take that attitude can prove to be suicidal. Despite the apparent complexity of specifications you may inherit, remember the prime contractor usually is most willing to assist you. Don't be afraid to discuss them with him if there is any possibility that you may not understand what he wants.

If you know what is wanted, the only precaution remaining is to see that your quality control group is adequate to properly police the specification. Return freight comes out of *your* pocket.

• *An extra copy of this article is available until supply is exhausted. Write Editorial Service,* STEEL, *Penton Bldg., Cleveland 13, O.*

New Roles for Powdered Metals

At the annual meeting of the Metal Powder Association in Cleveland (Apr. 10-12), members heard of some novel applications. Among them: Nuclear power plants, APM aluminum, electrical and electronic uses



"NUCLEAR scientists and engineers are turning to powder metallurgy for critical parts in atomic reactors," H. H. Hausner, general manager, Penn-Texas Corp., New York, told the Metal Powder Association in Cleveland.

"Internal structures of metals suffer less damage from radiation," he said, stating that uranium alloys, for example, change less and are more resistant to corrosion than uranium itself.

Mr. Hausner pointed out that, although nuclear reactors are designed by physicists, the material and metallurgical engineers are needed to make them effective . . . that's where powdered metals come in.

Challenge—Here are some of the problems he emphasized:

1. Heat transfer (fuel to coolant, coolant to heat exchanger).
2. Internal corrosion caused by the coolant.
3. Strength of materials at elevated temperatures.
4. The behavior of materials under radiation.

These materials are being used in attempts to solve them:

1. For the fuel, uranium and and thorium.
2. Beryllium for the moderator (slows down the reactor).
3. Zirconium for use with the fuel and in reactor construction.

These metals are used either in their pure form, as alloys or as cermets. Zirconium is used as a cladding material.

Powders — Beryllium is brittle and can be pulverized to any size. The other metals are ductile and must be reduced to a powder by heating in hydrogen (hydrides), then decomposed in a vacuum to form metallic sinter cakes, which are ground to size.

Uranium, thorium and zirconium powders also can be made by the calcium reduction of their oxides, Mr. Hausner said. Thorium and zirconium powders can be made by electrolytic methods, and the sodium reduction of thorium oxide is being considered.

Handling—Great care is needed to handle the powders of these unusual metals, it was pointed out. For instance, beryllium powder is poisonous. Zirconium powder burns easily. Uranium and thorium powders are both poisonous and burnable.

Such powders are handled in closed boxes . . . beryllium in ordinary air and the others with an inert gas like argon or helium.

"Beryllium does not compact to a high density. Even at high temperatures, sintering does not produce complete densification. Vacuum sintering is better than argon, especially at low temperatures. Vacuum sintered material can be repeatedly cold rolled 10 per cent and annealed," explained Mr. Hausner.

These two methods are used to hot press beryllium: Low pressure at 3340°F or warm pressing at 2040°F and 25 tons per sq in.

Zirconium—This is one of the best metals for powder metallurgy. Powders made from the hydride will reach full density at 60 tons per sq in., sintered for 3 hours at 4172°F. "Metallic zirconium powder," he said, "does not densify completely even at 4370°F."

Sintered zirconium is highly ductile and can be cold worked and rolled without any difficulty. Pure zirconium powder is seldom made into reactor parts; its alloys are quite important.

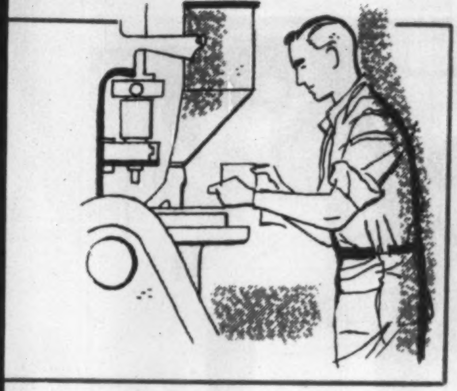
Uranium—The powder of this strategic metal comes from hydriding or from the pure metal. "There is only one way to get a a perfect, dense, pore-free part and that is by hot pressing," he explained. Compacting uranium powders in a vacuum at 2040°F and 10 tons per sq in. gives a material of 100-per-cent density. Ductility is fairly low, but heat treatments will rectify it.

Thorium—"Decomposed thorium hydride powder makes the best sintered compacts but not the most economical," Mr. Hausner said. Powder made from the electrolysis of fused salts or by calcium or sodium-reduction of the oxide is cheaper.

Alloys and Cermets—There are two ways to form alloys: Compacting and sintering the alloy powders, or mixing the powdered components and forming the alloy during sintering. The latter is more attractive since many of the alloys contain a light metal (like aluminum) in combination with uranium which is extremely heavy. "During ordinary melting and casting, segregation occurs and sometimes, double or even triple melting is required," he said.

Cermets are the high temperature materials. Mr. Hausner said that reactor designers are looking closely at mixtures of uranium, thorium and plutonium in a metallic matrix or uranium oxide in a matrix of aluminum or stainless.

"From such materials will come better and better fuel elements in



nuclear power reactors," he said.

Electrical Uses—A. S. Doty, staff metallurgist, P. R. Mallory & Co. Inc., Indianapolis, told the group: "The electrical and electronics industries are aware of the impact of powdered metals in their components . . . in many applications, powder metallurgy offers design opportunities impossible with any other method."

He suggested that these were some of the most important: Batteries, sliding contacts (for motor and generator brushes) permanent magnets, soft magnetic materials, contacts, lamps and tubes, resistances, and electrolytic capacitors.

"Capacitors for aircraft must operate at minus 40°F. A porous, sintered-tantalum anode makes it possible for capacitors to operate over the range of minus 122 to plus 737°F," he explained.

Batteries — Sintered-plate, nickel-cadmium storage batteries are a German development of World War II vintage. Carbonyl-nickel powder is sifted into a graphite die around a woven wire grid and sintered into a porous (80-percent) plate. "The plate is then impregnated with nickel oxide or cadmium," he continued.

Sliding Contacts—High electrical conductivity, wear resistance, lubricating qualities and resistance to arc erosion are of first importance in sliding contacts like brushes. Copper-graphites with 5-to-70-per-cent graphite, bronze-graphites and silver-graphites are used.

"Several Alnico permanent magnets are made by powder metallurgy—Types II, IV and V. The larger sizes are cast, but most sizes. 0.05-lb and under. are sintered," Mr. Doty said.

Another type called Vectolite is made of ferric and ferrous oxides in combination with cobalt oxide. He said that although residual induction is weak (1600 gausses), it has a higher coercive force—900 oersteds, compared with 500 to 700 for Alnico.

Contacts — He explained that most troubles with contacts centered on sticking and erosion. Tungsten is widely used because of its high melting temperature and because it doesn't form non-conducting oxides during use. "High usage deforms some materials . . . tungsten's hardness is an effective weapon," he stated.

Although molybdenum is inferior to tungsten, the oxide is volatile and contributes to a clean contact surface.

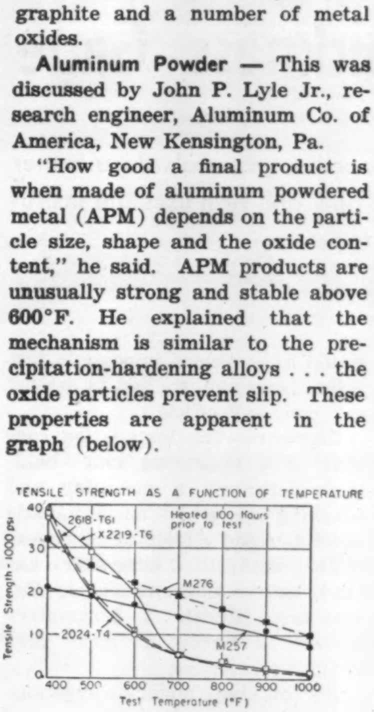
"Some applications require a combination of conductivity and good resistance to high temperatures," he continued. Copper-tungsten is used here—a combination impossible without powder metallurgy. It is used for power circuit breakers and transformer tap changers. Generally used in oil, they work successfully in air.

He also mentioned other combinations like silver-tungsten, silver combined with molybdenum, graphite and a number of metal oxides.

Aluminum Powder — This was discussed by John P. Lyle Jr., research engineer, Aluminum Co. of America, New Kensington, Pa.

"How good a final product is when made of aluminum powdered metal (APM) depends on the particle size, shape and the oxide content," he said. APM products are unusually strong and stable above 600°F. He explained that the mechanism is similar to the precipitation-hardening alloys . . . the oxide particles prevent slip. These properties are apparent in the graph (below).

TENSILE STRENGTH AS A FUNCTION OF TEMPERATURE



"One unusual characteristic is reverse elongation. At high temperatures, APM products have less elongation," he said. Other good high temperature features are evident, such as improved stability, hardness, stress-rupture strength, creep resistance, fatigue resistance and electrical conductivity.

Forms—M257 and M276 cakes are used to form extruded shapes like rods, bars, squares, etc. The materials make excellent forgings, extrusions, tubes and impact extrusions. He said that a wide variety of fasteners (bolts, rivets, screws) are made from wire. Sheet is readily rolled and foil can be hand rolled down to 0.0014-in.

"Most of the joining work with APM products has been done with M257 sheet and plate. Flash welding gives high strength joints at room and elevated temperatures. Spot welding has met with partial success," Mr. Lyle continued.

Plating—It was pointed out that General Motors has been successful in applying 0.001-in. layers of hard chrome to the bore of M257 pneumatic cylinders. "Alumite hard coatings are commercially feasible, although it requires higher voltage . . ."

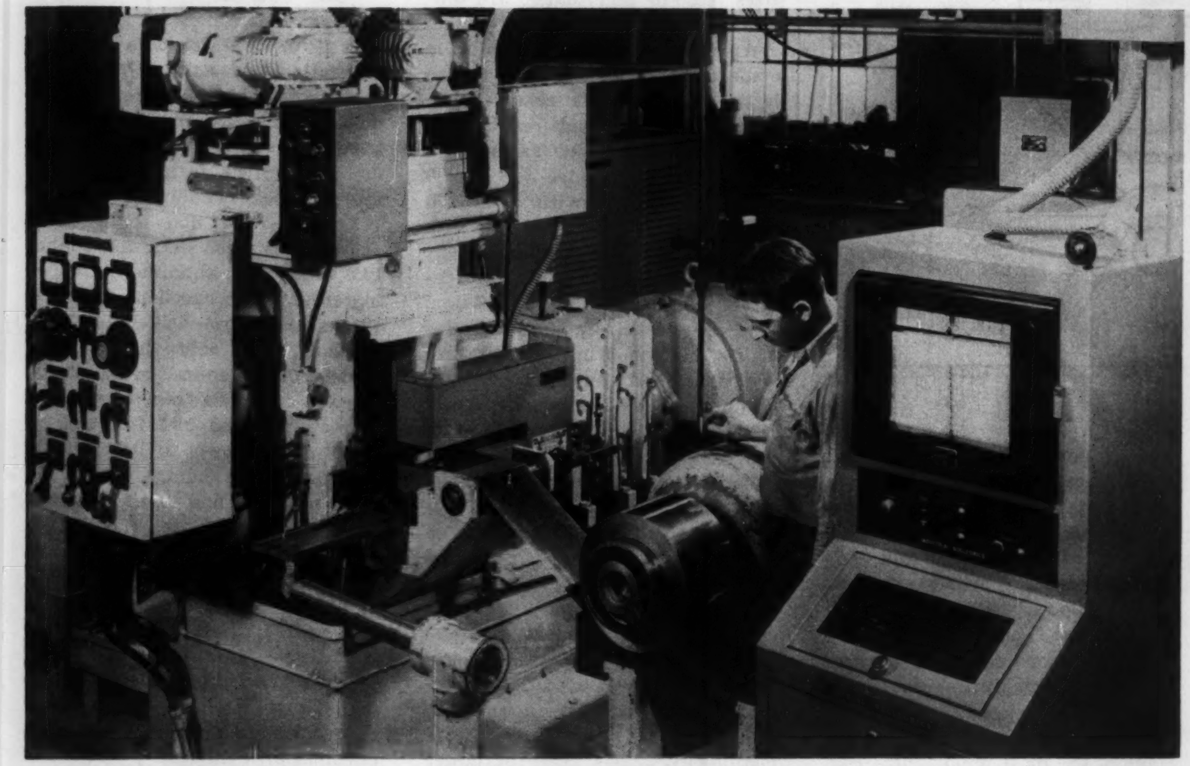
Tests are in progress on corrosion resistance. To date, there is little evidence of stress corrosion.

Machinability appears to be as good as 2024-T4, with no tool wear problems. "Several customers who do extensive machining have substantiated this," he stated.

Mr. Lyle concluded by saying that APM products have high strength and stability at elevated temperatures and have raised the useful range of aluminum alloys by about 300°F.

Brass—E. A. Anderson and E. H. Rennhack of the research department, New Jersey Zinc Co. (of Pa.), Palmerton, reported the discovery of an iron-nickel-phosphide hardened brass alloy that improves the properties of brass metal powder parts. "It has been found that parts with superior strength and hardness properties are obtained . . . certain alloys which do not harden appreciably during sintering achieve high hardness values when coined," they said.

The best alloy L1260 has a coined tensile strength of 44,100 psi, is 89 Brinell.



As the metal emerges from the left, it passes through the radioactive source which looks like a C-clamp. Thickness is traced graphically on continuous strip recorder on right

Radioactive Thickness Gage

From cigarets to thin strip, radioactive materials do a better job of nonstop gaging. Here is how one firm uses the instrument to check metal computer tape

SOMERS BRASS Co. is rolling computer tape (phosphor bronze) on a 4-high rolling mill down to 0.001-in. with tolerances of ±0.0001-in.

Automatic AccuRay gaging equipment, produced by Industrial Nucleonics Corp., provides the gaging controls.

Somers, like other mills, has been pressured for closer tolerances in metal strip and sheet. "When someone comes along and says they can give you tolerances that would have seemed impossible just a few years ago, we had to listen," say company officials.

Elements—The installation consists of a measuring unit (betagage detector), a mounting and scanning assembly, an automatic controller and a monitoring device.

The automatic controller has these safety mechanisms: 1. Excess error signal. 2. Servosafety system. 3. Excess correction time device. 4. Alarm.

By making minor corrections often, the automatic controller virtually eliminates the need for major corrections. If one is required, the alarm sounds and the mill shuts down. Manual adjustments are made.

One Extra—Somers and Industrial Nucleonics engineers discovered that a backlash compensator was needed. This unit adds enough "on time" for each reversal of the screws to take up play in the system (motor linkages and gears). This allows compensations to be made as the mill gets older, too.

Service—After installation, the process is checked completely, operators are instructed and manual versus automatic tests are run. The results help the customer decide if he wants the equipment. Emphasis is on engineering service.

Somers plans to install more AccuRay equipment soon. Say company officials: "Uniformity has been increased. We are getting more out of our mill. There is less waste. And, most important, it is saving time."

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Cottrell-type precipitator, mounted in the stack aisle on the roof of Kaiser's open-hearth shop at Fontana, Calif.

No Smoking for Kaiser

THEY DON'T take kindly to smoke in Los Angeles. In Fontana, which is practically next door, the feeling is echoed by Kaiser Steel Corp.

Kaiser has been working on fume control for its open-hearth stacks. A big problem has been to develop dust collecting equipment that will work efficiently under widely varying conditions. Fume pressure, temperature and contents change abruptly during the melt cycle.

Precipitators—Kaiser has nine 225-ton open hearths. Studies going back to 1943 pointed to the electrostatic precipitator as the type of dust catcher best adapted to the Fontana installation. One was installed on No. 3 furnace some years ago.

It provided experience that shows up in the design of Kaiser's second precipitator, a Cottrell type recently installed on No. 9 furnace. Its design and how it was tested were described by E. V. Akerlow, project engineer with Kaiser Engineers, J. H. Smith, technical engineer, and G. L. Rounds, research chemist, with the Air Control and Research Department, Kaiser Steel Corp., at the western meeting of the Association of Iron & Steel Engineers.

Design—The No. 9 precipitator was designed to handle 58,500 cu ft of dust laden gas a minute at 460 to 470° F and 29.92-in. of mercury pressure. Draft loss through the unit had to be held to 0.5-in. of water. Incoming dust was figured to average 0.43-grains per cu ft, which worked out in practice to about 160 lb of particles an hour.

The unit, purchased from Western Precipitation Corp., Los Angeles, took the shape of a rectangular box, about 17 x 17 x 60 ft. With dust collecting hoppers and electrical equipment, the whole thing made too difficult a package to fit on the kitchen floor when the No. 3 precipitator was installed.

Upstairs—The solution was to

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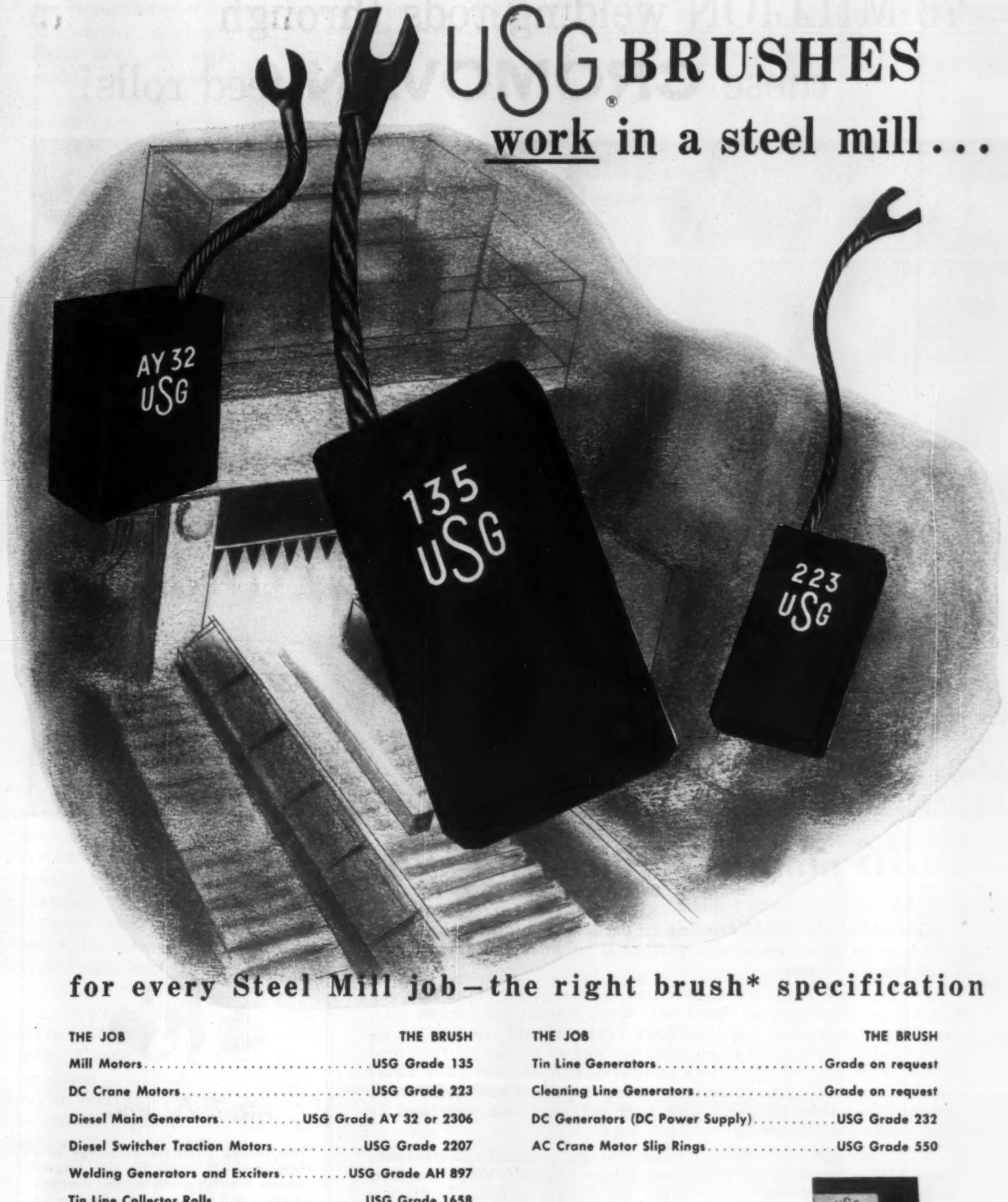
work in a steel mill . . .



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put it on the roof. That meant considerable bracing to take the 70-ton load and make it earthquake-safe. Stiffening also was necessary to keep vibration from cranes and charging machines from reaching the precipitator, where it could cause dangerous arcing.

Open-hearth fumes first pass through a waste heat boiler to lower their temperature, and rise from the kitchen floor to the precipitator through a main. The entry area of the precipitator slows the gases down and reduces their turbulence with a series of baffles. Perforated curved baffles just ahead of the precipitation section produce an even flow of gas through the electrostatic field.

Collector — As the fumes pass the discharge electrodes, they are ionized and attracted to the collection electrode curtain. Particle buildup on these electrodes makes it necessary to clean them periodically by mechanical rapping. A series of sharp blows delivered to the electrodes at 2-second intervals every 30 to 40 minutes knocks off the dust, which falls into collecting hoppers.

The rappers are pneumatically actuated and are mounted outside the collection chamber in an air-cooled area. The rapping cycle is automatic, but can be switched to manual control, necessary if extremely dirty material has been charged.

Power — Although Westinghouse selenium rectifiers have a higher first cost than mechanical rectifiers, they were used to power the No. 9 precipitator. One observed advantage is higher root mean square voltage, resulting in improved precipitator operation.

The company expects to install automatic controls to vary the voltage for more efficient collection during a lime boil and to quickly quench the arcing that accompanies hot metal charging.

Data for completely automatic control have been gathered by fume sampling and observations on the operating characteristics of the precipitator. They have been reduced and correlated on IBM equipment to give a factual picture of how the installation works and can be improved.

New Approach to Automation

When assembly is to be automated, it becomes the key operation. Parts must be designed for it first, says this expert. It shouldn't complicate machining design

AUTOMATION experts sound a warning. It may take a shift in thinking and practice to get the biggest return out of full automation.

Ralph E. Cross, executive vice president, Cross Co., Detroit, told tool engineers at the recent ASTE meeting: "In processing a product or subassembly today, we first think of how the parts are to be made, after which we plan for assembly, then put a warehouse between and tie them together with conveyors. This approach must be turned around."

According to Mr. Cross, when automation plans include assembly, the first decisions to be made are those concerning assembly. These decisions, he says, should be made on how much of the assembly can be mechanized, plus the processing tolerances and design changes necessary to sustain automatic assembly. In addition, check product design changes required to provide automatic handling and storage.

Automatic assembly may call for part tolerances tighter than those needed for the functional operation of the part. Also, he feels that once the part is designed for automatic assembly, there won't be any trouble designing equipment for automatic machining.

Computer Sets Schedule

The Bullard Co., Bridgeport, Conn., machine tool builder, is using an electronic computer to solve problems of production control, payroll and other accounting jobs. Officials credit the computer with the company's success in scheduling production at least six months in advance. It keeps track of thousands of parts, has them ready when and where they're needed.

The computer has saved Bullard some 500 clerical man-hours.

Customer Assist

It may take an occasional assist to make sure the customer is always right. Two years ago, when Howe & Fant Inc., East Norwalk, Conn., introduced a turret drill press, R. B. Fant, vice president, says management "figured that when we made six stations available from a single axis, customers would think in terms of fixtures that would accurately locate the holes under that axis. We hoped they'd forget about using box jigs. They didn't."

To coax more customers into high production use of the drill, Howe & Fant engineers came up with a small table that floats a template over a locating pin. The hole pattern in the template is identical to what's desired in the workpiece.

To make the whole thing work, the operator just pushes a lever with his left hand. This drops the locating pin, and the table floats free on ball bearings. The operator lines up the next hole and the pin resets in the proper spot in the template.

At the ASTE show, where the table was premiered, an operator was completing 16 operations (drilling, tapping and counterboring) on an aluminum plate. The job took 34 seconds.

GRIP OF STEEL. The steel reinforcing of the tire bead, upon which pneumatic rubber tires are built and which grip auto wheels securely, is made of high-quality CF&I-Wickwire Pneumatic Tire Bead Wire.

from tires to jar tops . . . wire works wonders

WELL PRESERVED. The wire closure on these glass preserving jars holds the tops tightly, maintaining the air-tight seal. This clamp is made from CF&I-Wickwire Galvanized Clamp Wire.

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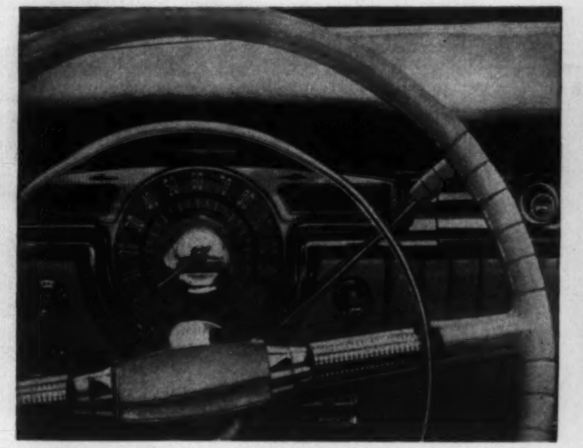
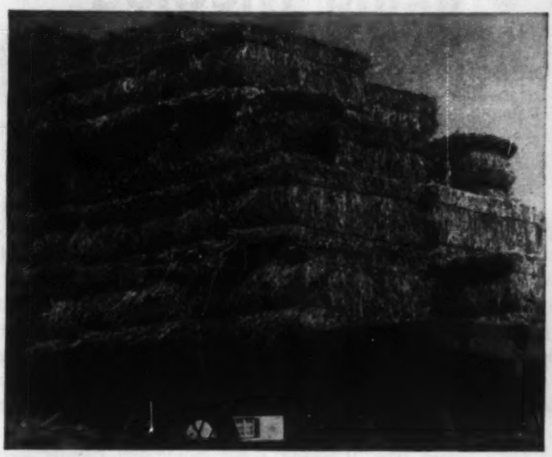
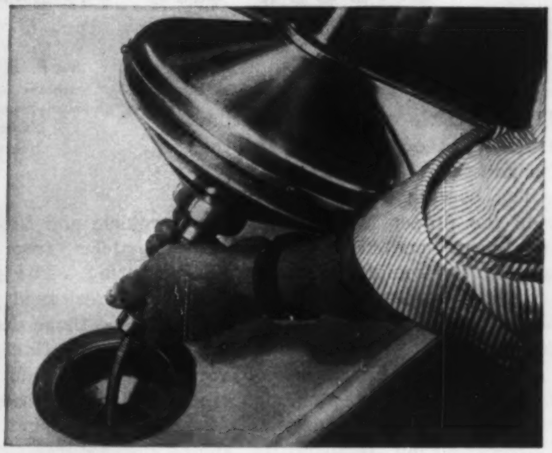


FLEXIBLE POWER. Speedometer cable is made of criss-crossed layers of CF&I-Wickwire Flexible Shaft Wire.

SHADES OF NIGHT. The curtain springs in window shade rollers are made from tempered CF&I-Wickwire Spring Wire.



ALL WRAPPED UP. CF&I-Wickwire Baling Wire is used in baling hay, straw, and other bulky farm products.



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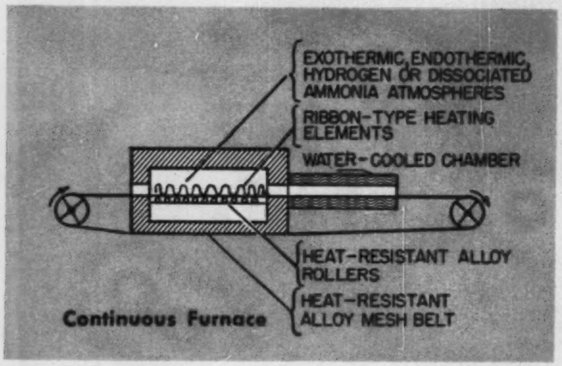
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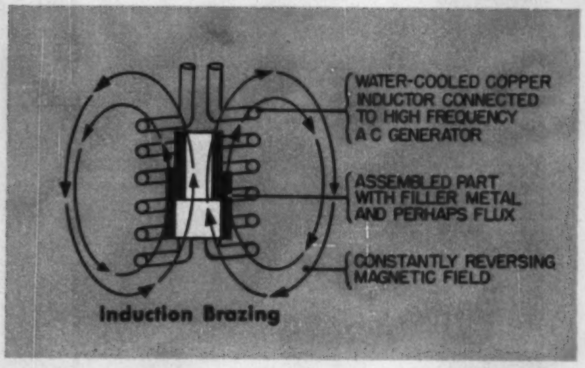
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Induction Brazing

Choose the Right Brazing Method

By P. D. JOHNSON
Assistant Technical Director
Chemicals-Pigments-Metals Division
Glidden Co.
Hammond, Ind.

THE TWO big variables in brazing are the method of heating and the filler metal.

The heating method must provide the proper brazing temperature, heat distribution and rate of heating and cooling. They depend on the properties of the base metal and requirements of the finished product.

Brazing filler metals must have: 1. Ability to wet the base metal to make a strong, sound joint. 2. Proper melting temperature and flow properties to permit distribution in the joint by capillary attraction. 3. A composition of sufficient homogeneity and stability to minimize separation by liquation and be free of excessively volatile constituents. 4. Necessary mechanical and physical properties in the joint.

Practices—Torch brazing still is in much use despite the emphasis on automation. In some countries, it accounts for more joining than all other brazing methods combined. It is particularly good for short runs and is used extensively in small shops.

Improved filler metals and fluxes enable those with little experience to do a good job; close attention to detail is all that usually is required.

Finely divided metallic powders in specially prepared vehicles are adaptable to torch methods and lead to some simplification. The vehicle and flux protect the metal particles from oxidation during heating. The paste is applied to the precleaned joint area. An envelope flame dissipates the vehicle, melts the flux and filler metal to produce a bond.

Gas Machines—These automatic machines burn a mixture of air and natural or manufactured gas in a molded refractory cup. Filler metal usually is preplaced. Work is carried in a fixture that passes through the enveloping flame to heat the parent metal and melt the filler metal.

A wide variety of base metals can be brazed this way. Workpiece temperatures range up to 1800°F. Other advantages: Low fuel and labor costs.

Furnace Brazing—First commercialized about 1930, furnace brazing is widely used in joining both ferrous and nonferrous metals. The essentially automatic nature of the process and its use of unskilled labor account for its popularity.

Furnace joining of intricate parts formed from many components is a simple operation. The shape and size of parts are limited only by furnace capacity. Finishing operations are minimized because furnace brazing atmospheres remove substantially all oxide surfaces. In most cases, furnace-brazed joints are almost as strong as the parent metal.

Procedure—Furnace brazing consists of heating an assembly of parts in a reducing or protective atmosphere to a temperature at which the filler metal will flow and form a bond. The parts are cooled in the same atmosphere to prevent oxidation. Atmospheres usually contain hydrogen or combinations of hydrogen and carbon monoxide.

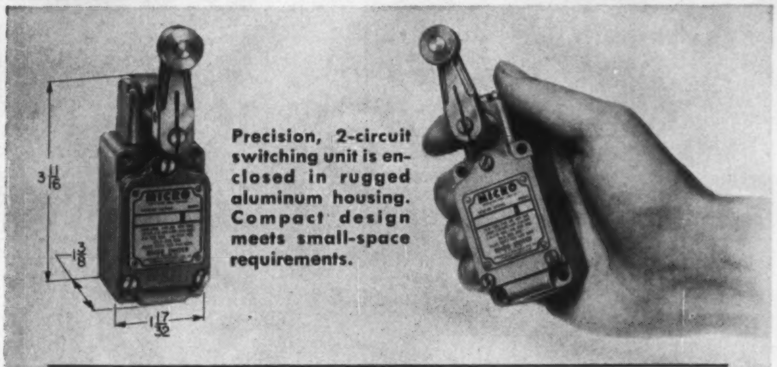
The three basic types of brazing furnaces are pusher, mesh belt and roller hearth. Pusher types can handle a variety of parts, but are not adaptable to automation. Large, continuous furnaces usually use roller hearth conveyors because they can carry heavy loads.

Induction Brazing—Used extensively, induction brazing is proving most adaptable to joining of important newer metals, such as titanium. The equipment usually consists of a series of concentric turns of internally cooled copper tubing shaped to the contour of the parts to be brazed.

Alternating current of up to 10 million cycles per second produces a magnetic field of high intensity which cuts through the part as it is placed in the field. A substantial portion of the electromagnetic energy is converted into heat. The extent of the heating is proportional to the frequency and intens-

MICRO precision switches

...THEIR USE IS A PRINCIPLE OF GOOD DESIGN



Precision, 2-circuit switching unit is enclosed in rugged aluminum housing. Compact design meets small-space requirements.

4 27/32
2 1/2
MICRO
MICRO SWITCH

Flush-mounted design which may be recessed into a cavity in the machine. Mounted on cover plate. Operating characteristics of both switches are identical.

Here is a small, 2-circuit limit switch to meet a wide variety of machine tool applications

This MICRO precision switch is designed to meet every requirement for a compact 2-circuit switch for use as a limit, safety or interlock switch on complex production equipment.

It has small size, extreme versatility, precision, reliability and ruggedness. All moving parts and the switching chamber are completely sealed, protected from wear or becoming fouled. Versatile field adjustability permits its use in practically any type of application or location.

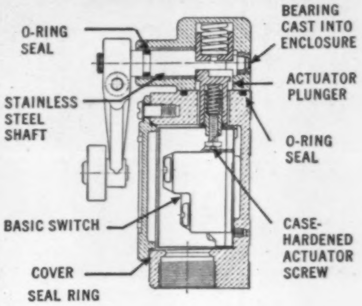
Two-circuit contact arrangement allows flexibility in circuit design. Reliability of the precision, snap-action unit assures accurate repeat operations throughout many millions of hard, fast actuations. Although small and compact in size, this switch is not only a precision instrument. It is designed and built to stand the most severe abuse.

The electrical rating is: 10 amperes 120, 240 or 480 volts a-c; ½ H.P. 115 volts a-c; 1 H.P. 230 volts a-c; .2 ampere 115 volts d-c; .1 ampere 230 volts d-c; .04 ampere 550 volts d-c. Pilot duty rating is: 600 volts a-c, max.

Like many other precision switches in the MICRO SWITCH line, this versatile 2-circuit switch is also an ideal component for installation on present plant equipment. MICRO precision switches make production machinery safer, more automatic and more productive.

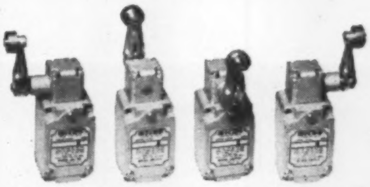
As shown above, this switch is also available in a flush-mounted design which may be recessed into a cavity in the machine. The operating characteristics of both switches are identical.

Seals Provide Maximum Protection



Sealing is provided by use of O-ring seals on the actuator shaft and between the actuator head and the housing. A synthetic rubber ring seal is provided for the cover. These seals provide maximum protection against entrance of dust, oil and other liquids. The switch meets NEMA specifications for an oil-tight pilot device.

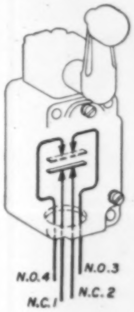
Adjustable Head Assembly



The switch is easily mounted in almost any location. The user can remove the head and locate it in any of 4 positions (as illustrated). The actuator arm is field adjustable to any position through 360° and can be adjusted to operate in either direction or in both directions.

Contact Arrangement

Contact arrangement of the basic switching unit is double-throw, two-circuit, single-pole, double-break. A single-pole, double-throw circuit can be obtained by tying together one normally-open and one normally-closed terminal and using this connection as the common terminal.



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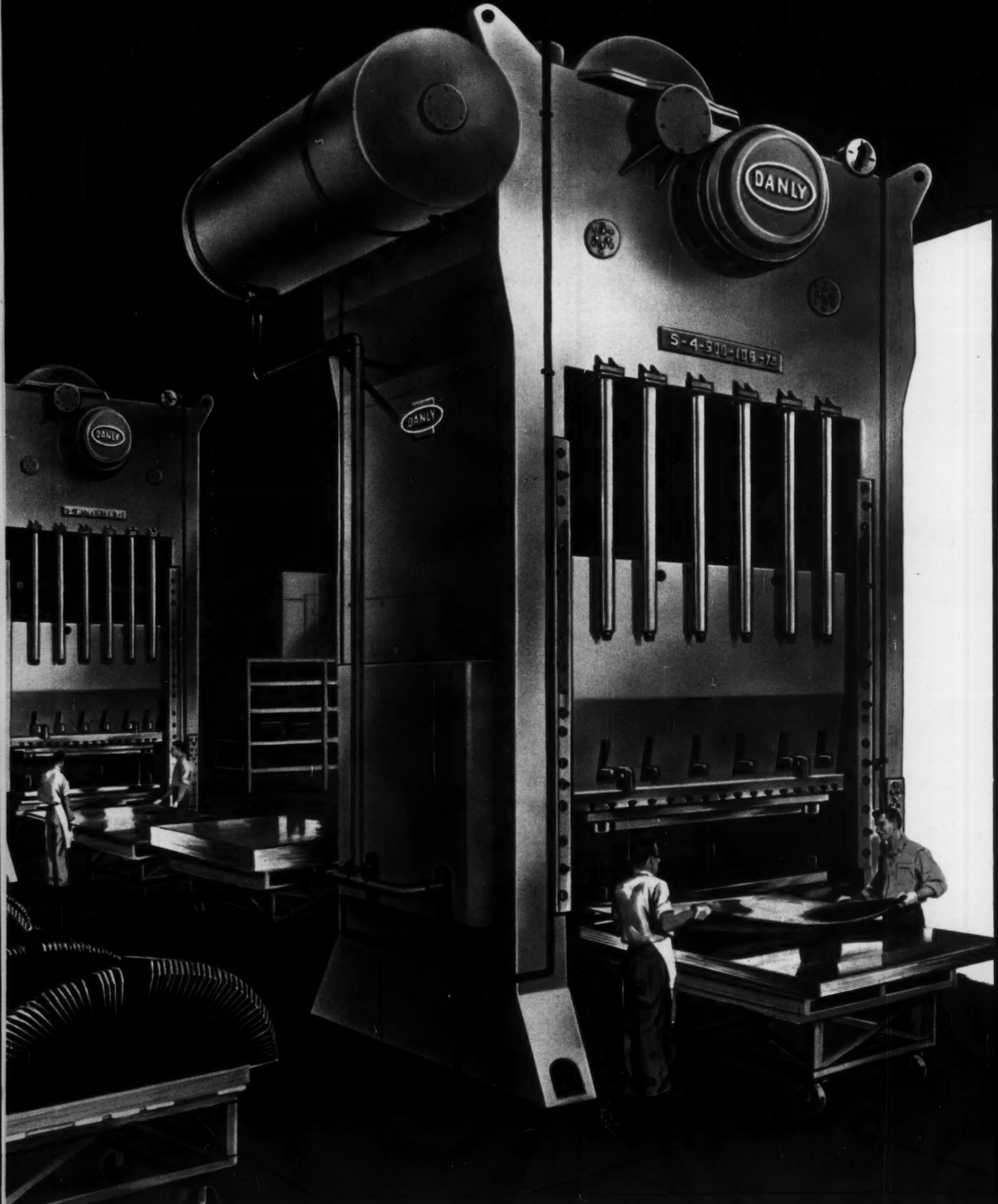
New "triple duty" Danly Press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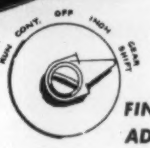
-Draws-Blanks-Forms



FINGERTIP GEAR CHANGE AND EXTRA LONG SHUT HEIGHT ADJUSTMENT PERMIT QUICK SHIFT FROM BLANKING TO DRAWING OPERATIONS...SOLVE SHORT-RUN STAMPING PROBLEM FOR LEADING HEATING UNIT MANUFACTURER

A leading manufacturer of home heating units needed a great variety of stampings . . . large blanks, drawn parts and deep formed pieces. Stamping these parts on a relatively short-run production basis would tie up entire lines of presses . . . unless one press could do the job. A specially designed Danly Press that blanks, draws and forms . . . and converts to these three types of operations quickly and easily . . . solved the problem.

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If your operation requires short production runs of a great many different kinds of stampings, Danly can help solve your production problem, conserve work-hours and manpower. Danly presses will make your pressroom more efficient for your specific type of work. *Talk with a Danly engineer – soon!*

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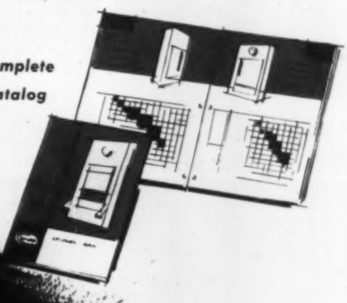

Stocks of parts produced on the specially built "triple duty" Danly Press. Note variety and size, particularly depth of form on V-shape stampings.

The contrast in these parts typifies the production problem solved by the Danly "triple duty" press.

An array of stampings like this would normally require several types of presses.

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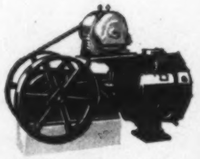
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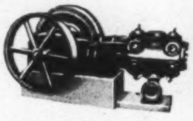
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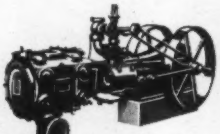
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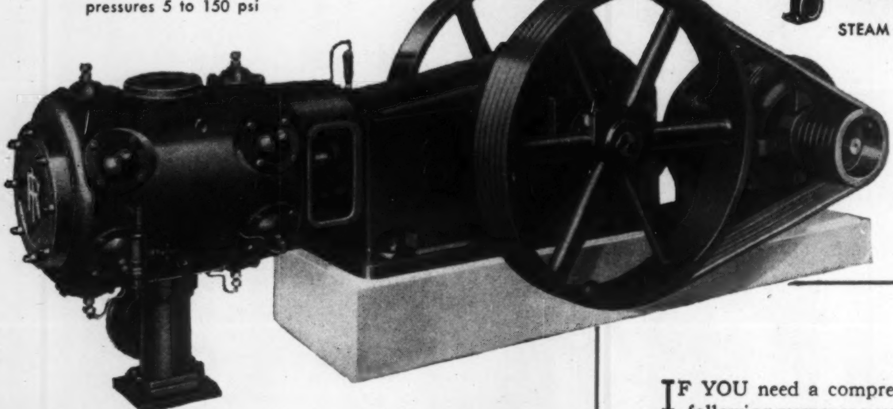
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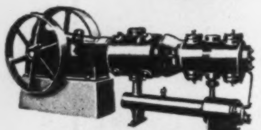
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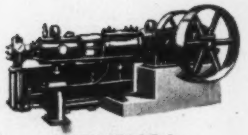
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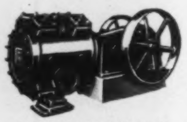
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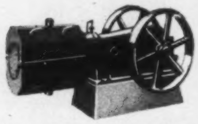
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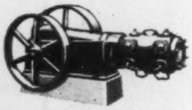
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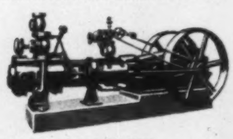
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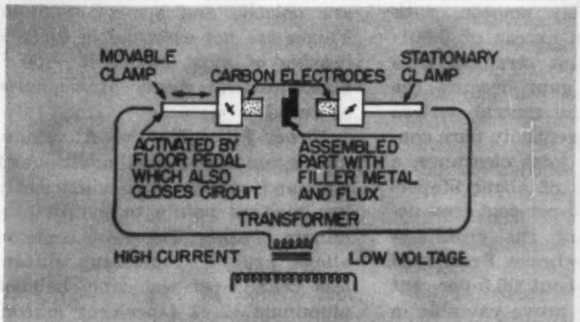
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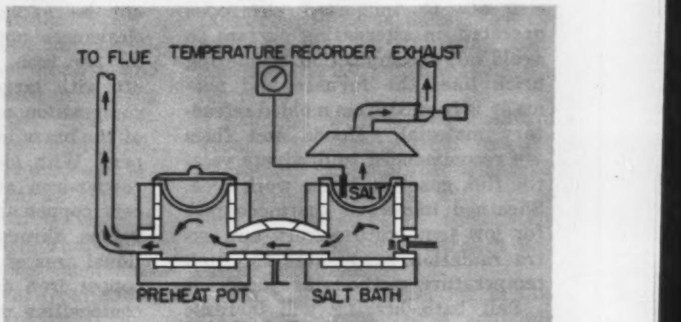

Salt Bath Furnace

ity of the current, the nature of the parent metal and the proximity of the part to the field.

Efficiency — For most efficient heating, magnetically susceptible parts should be used. Heating results from both the effects of hysteresis and eddy current losses. Nonmagnetic parts are heated by eddy current losses only.

The efficiency of induction brazing depends largely on the proximity of the area to be brazed and the induction coil. Any given coil can be used only with parts of a generally described shape.

Power Source—Three types of equipment generate the electromagnetic fields necessary for induction heating. Motor generators are used primarily for melting purposes because their low frequency (2000 to 10,000 cycles per second) provides good depth of heating. Spark gap generators, which provide up to 200,000 cycles per second, are reasonably popular, but valve generators are preferred because they provide from 350,000 to 10 million cycles per second. The efficiency of an induction coil improves in proportion to the frequency of the electromagnetic field.

Advantages—Induction methods are suitable for brazing large parts which require joining in one or more limited areas. Localized heating makes this process more efficient than furnace brazing in terms of heat input on this type part. Furnace brazing is superior on large parts requiring multiple joining.

Large gaps can be joined by induction brazing because one surface can be heated before the other. Protective atmospheres are not required normally, and are difficult to achieve due to the nature of the equipment. Uneven heating limits the process in most cases to the joining of similar metals only.

Resistance Joining — This procedure is restricted primarily to small parts, such as electrical connections composed of copper and copper alloys. Parts are placed between two electrodes and current from a low-voltage, high-density battery or transformer is passed through the system.

Heating of the parts is generated by contact with the electrodes. It is proportional to the resistance of the electrodes and the parent metal, the interfacial area to be brazed, the square of the current and the time it flows.

Electrodes may be carbon, graphite, refractory metals or copper alloys. Resistance brazing lends itself to automation; the electrodes can be moved along a transverse axis by a foot pedal arrangement which activates current flow at the same time.

Salt Bath Brazing — Although relatively new, this process is gaining in popularity. It consists of three stages—preheating, immersion in the salt bath and flux removal. The process is adaptable to automation. For example:

1. Filler metal is put in place as the part is assembled and, if necessary, tack welded.

2. Part is placed on conveyor. (A series of parallel conveyor lines can be driven by a single motor.)

3. Conveyor lowers part into preheat pot followed by immersion in salt bath. (Time intervals at each stage will depend on various factors. Best efficiency must be determined by experiment.)

4. Conveyor raises part from salt bath and excess salt drains into pot.

5. After salt on the part has solidified, conveyor lowers part into an oil bath to crack the salt surface and harden the part.

6. Conveyor removes part from oil bath and lowers it into hot water to remove salt.

7. Alternate wire brushing and immersion in hot water may be necessary to remove flux completely.

Bath Composition—The molten salt must be able to dissolve oxide surfaces on the parent metal to permit flow of filler metal throughout the joint area. The type salt used depends on the filler and parent metals. Cyanides and, where decarburization is not a vital consideration, mixed chlorides and carbonates are used frequently with silver-base alloys and brass.

High temperature joining uses salts, such as barium chlorides, borax and various silicates. Inadequate salt removal after brazing is most generally encountered with borax and silicate-type fluxes which form hard, glassy surfaces.

Furnaces—One type furnace is gas fired with a pot of nickel-chromium or nickel-chromium-iron containing the molten salt. The heating chamber is lined with firebrick backed by insulating brick and all is enclosed in a steel housing. Preheating parts in an adjacent pot heated by the exhaust gas from the salt bath furnace raises the efficiency of the process. Subsequent immersion of the preheated part lessens fluctuations in the salt bath temperature. Temperature usually is maintained by hand adjustment of the gas burner.

Electrically heated furnaces use

external, ribbon-type resistance elements or immersed electrodes operated on alternating current to avoid salt decomposition. Insulating brick lines the furnace and normally is formed from molded refractory material. Hoods and flues are recommended to dissipate volatile flux gases from the work area. Sheathed immersed thermocouples for low temperature work and extra radiation pyrometers for high temperature methods are used.

Salt bath brazing will increase as better salts are developed. Research should be keyed to the search for salts which can be used effectively in joining stainless steel and heat resistant alloys.

Dip Brazing—This method uses equipment similar to salt bath brazing. Molten metal is contained in a gas or oil-fired plumbago pan. The firebrick-lined furnace is contained in a steel framework. An assembled part is dipped through a liquid flux floated on the surface of the molten filler metal. The metal penetrates the joint areas when temperatures in the bath become equalized.

Raising the part through the flux surface forms a quick-hardening, protective film that is removed according to salt bath procedures.

A desirable combination is molten brass (60-40) covered by a 75-per-cent borax, 25-per-cent boric acid flux. The flux surface minimizes zinc vaporization. Although not extensively used, dip brazing's similarity to salt bath practices suggests the possibilities of automation. Limitations result from large consumptions of filler metals due to flash coatings, the extent of which is proportional to the surface area.

Brazing Metals — Diverse processes and metal requirements have necessitated the development of many joining metals. Copper has been used extensively. It is cheap, makes strong joints and is easy to use.

Copper is maintained easily in the metallic state and exerts virtually no vapor pressure at brazing temperatures. It is used commonly in furnace brazing mild and low alloy steels and affords shear strengths of about 33,000 psi in low carbon steel with about 0.001-in. per gap. There are few instances where strengths of this magnitude are not adequate.

The ideal joining surface should not be excessively smooth, with clearances not in excess of 0.001-in. per inch. Joint strength falls off with larger gaps because the composition of the central portion of the braze is essentially pure copper. With ideal joint clearance, a copper-iron alloy of about 95-per-cent copper and 5-per-cent iron develops throughout the cross-sectional area of the braze. Prealloyed copper iron of about 95.5-per-cent composition may prove valuable in applications where wider gaps are encountered.

Brass—A composition of 60-per-cent copper and 40-per-cent zinc is most adaptable to brazing methods using rapid heating (it minimizes zinc distillation). Roller-hearth-type furnaces are reasonably suitable since fairly rapid heating is obtained by stages rather than continuous movement of the conveyor system.

Copper (92 per cent) phosphorous (8 per cent) is not popular because its lack of ductility makes it difficult to shape. Phos-copper-silver wire (6-88-6 or 5-80-15), shaped to the contour of the brazing areas, is used extensively to join brass. Phos-copper-silver has a wide solidus-liquidus range (about 625-705°C); to assure complete fluidity of joining metal, rapid heating to above this range is essential.

Silver-Base Alloys—Although of relatively recent origin, there are many types of silver-base alloys. They normally contain at least 42-per-cent silver and varying amounts of copper and zinc. Cadmium often is included and, to a lesser extent, manganese, nickel or tin.

The silver alloys can be used with a wide range of base metals, especially those which contain cadmium. Eutectic types are preferred on jobs requiring considerable fluidity or in furnace brazing methods. Many silver alloys have wide solidus-liquidus ranges. They are used more than any other material in resistance brazing.

Advantages—The desirable features of silver-base alloys are their low melting point (as low as 1150° F), versatility, ductility, strength and minimized distortion of parts due to low operating temperatures.

Disadvantages are relatively high cost and the necessity in most cases of using fluoride fluxes which are volatile and somewhat toxic. Fluxes are not essential in furnace brazing of most metals if −60°F dissociated ammonia atmospheres are used.

Newer Filler Metals—Aluminum alloys containing small additions of zinc and silicon have sufficiently low melting points to permit aluminum brazing. The more common alloys are: 1. 5-per-cent silicon, less than 1-per-cent zinc, balance aluminum. 2. 7½-per-cent silicon, less than 1-per-cent zinc, balance aluminum. 3. 10-12-per-cent silicon, balance aluminum. 4. 10-per-cent silicon, 4-per-cent copper, balance aluminum.

Alloys 3 and 4 lack ductility and are used mostly in the dip process or in form of rods for torch brazing. Acceptable results have been obtained with clad sheets formed from aluminum alloys.

High Temperatures—Heat resistant alloys must have joint qualities which withstand fatigue and corrosion at elevated temperatures. Although copper and silver alloys are used to join these metals, some new alloys promise superior results. Two recent developments have the following composition: 93.25-per-cent nickel, 3.50-per-cent

Brazing Alloys . . .

Brazing Method	Copper	Copper-Base Alloys
Dip		
Furnace	Cu P Cu P Ag Ag Ag Cu Ag Cu Zn Ag Cu Zn Cd	Cu P Cu P Ag Ag Ag Cu Ag Cu Zn Ag Cu Zn Cd
Induction	Cu P Ag Ag Cu Ag Cu Zn Ag Cu Zn Cd	Cu P Cu P Ag Ag Cu Zn Ag Cu Zn Cd
Resistance	Cu Zn Cu P Cu P Ag Ag Ag Cu Zn Ag Cu Zn Cd	Cu P Ag Ag Ag Cu Zn Ag Cu Zn Cd
Salt Bath	Cu P Ag Ag Cu Zn Ag Cu Zn Cd	Cu P Ag Ag Cu Zn Ag Cu Zn Cd
Torch	Cu Zn Cu P Cu P Ag Ag Cu Ag Cu Zn Ag Cu Zn Cd	Cu P Cu P Ag Ag Cu Zn Ag Cu Zn Cd
Vacuum		

silicon, 2.25-per-cent boron, 1.00-per-cent others; and 82.10-per-cent nickel, 4.50-per-cent silicon, 2.90-per-cent boron, 7.00-per-cent chromium, 3.00-per-cent iron, 0.50-per-cent others.

Various alloys of copper containing low percentages of refractory metals give good joint strength in alloy steels up to temperatures of 500°F. They usually contain at least 90-per-cent copper and will include one or more of the elements manganese, cobalt, iron, nickel, silicon or chromium. Shear strengths of 50,000 to 60,000 psi are possible.

Fluxes—Although some brazing does not require fluxing, in most cases it must be regarded as a necessary evil. Fluxes remove oxides from the parent metal surface so the displacing filler metal may thoroughly wet the interface area.

Borax or a combination of borax and boric acid are molten and active at temperatures over 1600°F and can be used with brass and copper in brazing various steels. It often is desirable to use a borax-boric acid flux in furnace brazing common steel with copper. Removing flux is difficult because it forms a hard, glassy surface. Because of its noncorrosive qualities, this flux need not be removed unless the brazing process is followed by galvanizing or plating.

Other Compounds—Fluorides, bifluorides, fluoborates, borates and boric acid are combined in varying degrees and amounts. The components may be twofold or multiple. Fluoride fluxes are molten and active at temperatures as low as 1000°F and are used extensively with silver-base alloys. Their high chemical activity makes them suitable for oxide removal from stainless and heat resistant alloys.

Disadvantages are toxicity due to the volatility of fluoride compounds and the difficulty in removing them—especially those using borates. These fluxes are highly corrosive and always must be thoroughly removed. Other fluxes which are used in lesser amounts include various chlorides. Some fluxes contain rather substantial amounts of silicon and are used in brazing high silicon iron (up to 24 per cent, such as Meehanite). Phosphates are used occasionally in brazing copper alloys.

Atmospheres — Protective atmospheres are used primarily in furnace brazing, but they are vital in some induction brazing. Exogas, having a dew point of about −60°F, results from combusting a lean mixture of natural gas and air. Scrubbing often is done to reduce oxidizing and decarburizing components—carbon dioxide and water vapor.

Endogas, with a dew point of about 0°F, results from reacting stoichiometric quantities of natural gas (largely methane) with air, so that the products of combustion are almost entirely hydrogen and carbon monoxide.

Where highly refractive metals are involved, dissociated ammonia or dry hydrogen are essential. Dew points of about −65°F are obtainable.

In their pure form, zinc, chromium, silicon, titanium, aluminum and magnesium would oxidize upon cooling in all types of atmospheres. However, most of the metals are brazed in the alloyed state where their oxidization susceptibility is depressed. Example: Dissociated ammonia or oxygen-free hydrogen with −65°F dew points will not oxidize chromium-containing stainless steels in furnace brazing operations.

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Related to Base Metals and Heating Methods

Mild & Low Refractory Alloy Steels	High Refractory Alloy Steels	Iron	Nickel-Base Alloys	Cemented Carbides	Aluminum & Aluminum Alloys	Magnesium	Titanium	Zirconium
Cu Zn	Cu Zn	Cu Zn		Ag Cu Zn Cd			Ag Cu Zn Cd	Ag Cu Zn Cd
Ag Cu Zn	Ag Cu Zn	Ag Cu Zn						
Ag Cu Zn Cd	Ag Cu Zn Cd	Ag Cu Zn Cd						
Cu	Cu	Cu	Ag Cu Zn	Cu	Al Si Zn	Mg Be		
Cu Zn	Ag Cu Zn	Cu Zn	Ag Cu Zn Cd	Cu Zn	Al Si Cu			
Cu Sn	Ag Cu Zn Cd	Ag Cu Zn	Ni Cr	Ag Cu Zn				
Ag Cu Zn	Ni Cr	Ag Cu Zn Cd	Ag Mn	Ag Cu Zn Cd				
Ag Cu Zn Cd	Ag Mn							
	Ni Si B							
Cu	Ag Cu Zn	Ag Cu Zn	Ag Cu Zn	Cu			Ag	
Cu Zn	Ag Cu Zn Cd	Ag Cu Zn Cd	Ag Cu Zn Cd	Cu Zn			Ag Cu Zn Cd	
Ag Cu Zn				Ag Cu Zn			Ti alloys	
Ag Cu Zn Cd				Ag Cu Zn Cd				
Cu Zn								
Ag Cu Zn Cd								
Cu Zn	Cu Zn	Cu Zn	Ag Cu Zn	Cu Zn	Al Si Zn	Mg		
Ag Cu Zn	Ag Cu Zn	Ag Cu Zn	Ag Cu Zn Cd	Ag Cu Zn	Al Si Cu			
Ag Cu Zn Cd	Ag Cu Zn Cd	Ag Cu Zn Cd		Ag Cu Zn Cd				
Cu Zn	Ag Cu Zn	Cu Zn	Cu Zn	Cu Zn	Al Si Cu	Mg	Ag Cu Zn Cd	
Ag Cu Zn	Ag Cu Zn Cd	Ag Cu Zn	Ag Cu Zn	Ag Cu Zn				
Ag Cu Zn Cd		Ag Cu Zn Cd	Ag Cu Zn Cd	Ag Cu Zn Cd				
							Cu	Cu
							Ag	Ag

Note: In all cases, it is assumed that parts to be brazed are the same metal. To determine the alloy for joining dissimilar metals, find a brazing alloy acceptable for joining either metal to itself. Example: Copper can be bonded to copper and mild steel to mild steel by torch brazing with brass as the filler metal. You can assume that copper and mild steel can be bonded to each other by the same method. The only basic exception is induction brazing where joint clearances are difficult to determine because of uneven heating.

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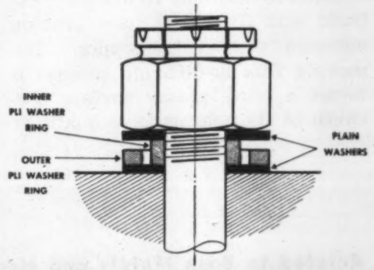
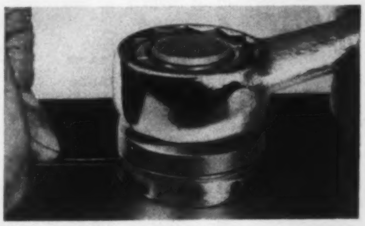
Tightening Twist

GETTING more out of a bolt is a matter of precise torque. Where weight and stress are critical and you need closer control, the preload indicating washer (PLI) may be the answer. The maker claims that it is accurate to within 10 per cent of the selected preload.

The PLI washer assembly gets its precision from the amount of force necessary to mash a washer to a predetermined thickness. It consists of an outer washer and a thicker, concentric inner washer; before assembly there is a gap between the inner and outer washer.

Ideally, plain washers are used over and under the PLI assembly to provide improved bearing surfaces. As the nut is tightened, the inner PLI washer is gradually cold worked until it fills the gap between the inner and outer washers. A wire wrench tells when the nut rests on the outer washer.



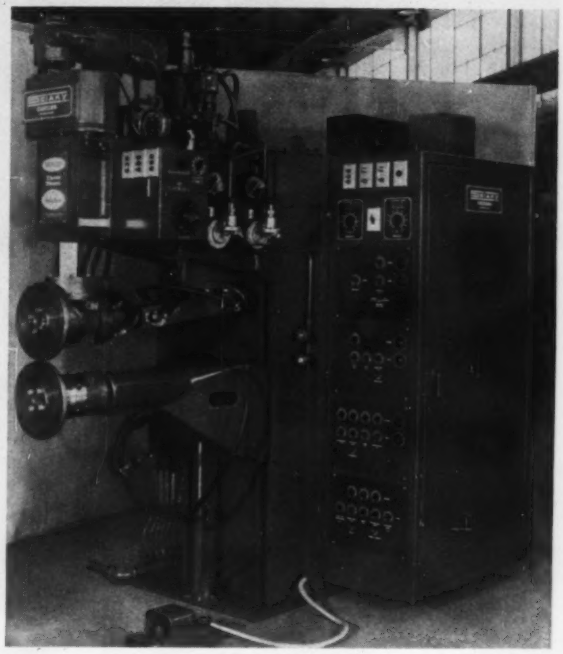


The feeler handle will move the outer PLI washer until the proper torque is reached and the nut rests on the washer. Cross sections show how the PLI assembly works

Three holes in the outer washer are for a wire wrench. As soon as the nut has reached the proper torque, it will prevent movement of the outer washer.

The washers are made by the Aircraft Products Division, Standard Pressed Steel Co., Jenkintown, Pa. They are made in a wide variety of metals in all usual sizes.

Welder Timing Control Operates on Line Frequency



A cold cathode gas tube called a Dekatron is the heart of a new resistance welder timing control. It counts the cycles of line frequency to time any machine function.

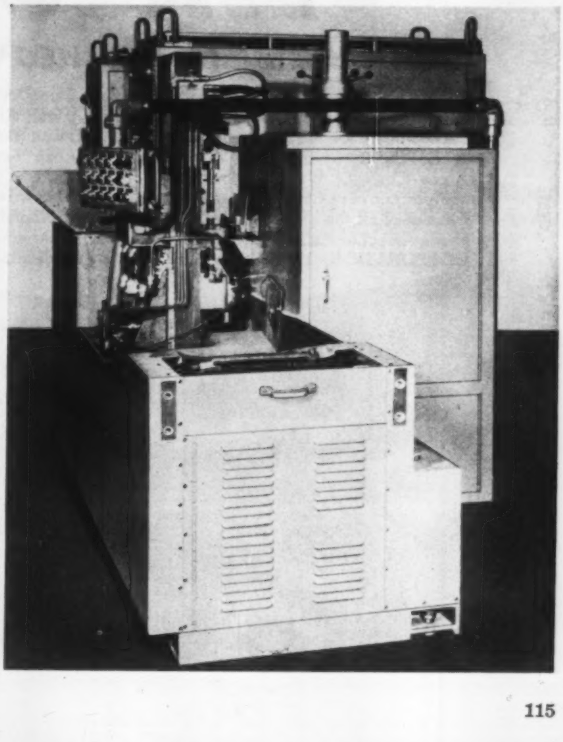
With one Dekatron tube, the count may be any sum from one to ten. Any operation which will furnish a pulse may be used to trigger the tube. By adding a decade Dekatron, the count may be increased to 100. Adding a third Dekatron increases the count to 1000, the maximum count of any of the functions on the new welder.

All the welder's functions are synchronous. Control dials for timing operations are calibrated in cycles. Control dials for interval functions are calibrated in impulses of secondary current.

One Dekatron tube controls the functions of "squeeze, preheat, weld, quench, post heat, hold and off" times. Another tube is used for the heat, cool, current delay functions.

Use of plug-in subassembly units in the control timer keeps maintenance down time to a minimum and permits the easy addition of extra welder functions. Defective units can be removed and replaced easily. *Write*: Sciaky Bros. Inc., 4915 W. 67th St., Chicago, Ill. *Phone*: Portsmouth 7-5600

Induction Machine Permits Rapid Surface Hardening



Key feature of a new line of induction hardening machines is a frequency range of 1200 to 1400 kilocycles. This permits rapid surface hardening of parts requiring shallow case depths and narrow transition zones between case and core. The faster operation prevents scale from forming on the part and reduces distortion to a minimum.

Solid parts up to 2 in. in diameter can be hardened. Capacity for nonsolid parts depends on part geometry.

The machines consist of three units: A power supply, an oscillator and a work unit. Work and oscillator units can be placed directly in a production line with the power supply unit several hundred feet away in an area of low-cost floor space.

Tooling can be changed easily. The use of a variable output transformer makes it possible to "dial a tool change" by varying the heat input to the coil. This eliminates the need to change coils when part size or configuration is changed during low production runs. It also eliminates the need for a large stock of expensive coil forms.

The work unit in the photo is tooled to harden hollow, thin-walled turbine shafts. *Write*: Process Machinery Division, Cincinnati Milling Machine Co., Cincinnati 9, O. *Phone*: Redwood 2121

PROOF of how to get dependable results welding by submerged arc

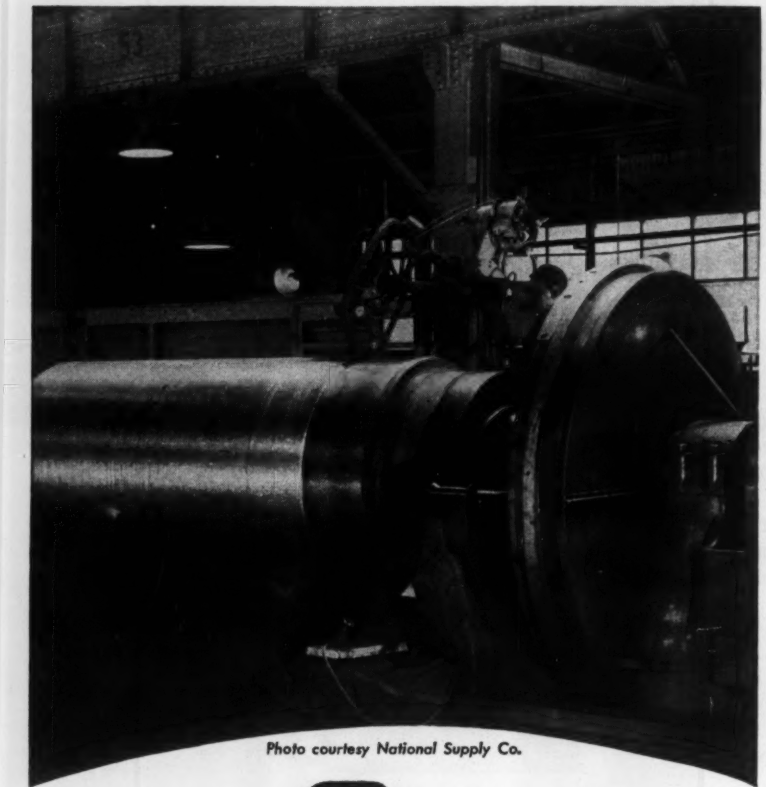
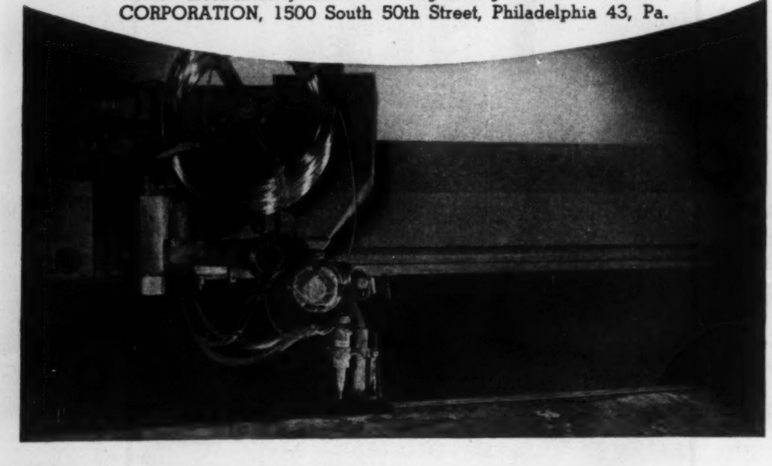


Photo courtesy National Supply Co.

WELD WITH ARCOS

CHROMAR Stainless COILED WIRE

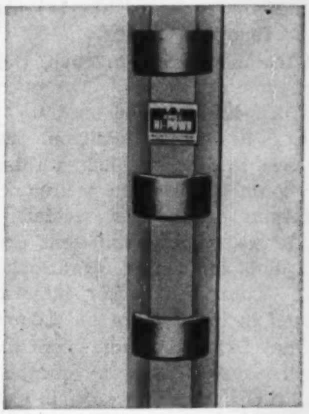
Shown above is a 72,000 lb. Extrusion Ram being overlaid by submerged arc with type 316 stainless weld metal. At the conclusion of the job the entire extensive welded surface was reported sound and crack-free—the same results you can expect with Arcos Chromar Wire on your own jobs. Arcos control of the composition of its Chromar *welding quality* spooled wire assures a transfer of all the elements needed to produce top notch stainless welds—mechanically sound and long lasting in service. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.



NEW PRODUCTS and equipment

Magnetic Conveyors

Existing belt lines can be converted to permanent magnetic conveyors by adding magnetic rail units. They move ferrous parts up inclines as steep as 75 or 80°.



The rail is a circuit of Alnico V magnetic castings, 4-in. wide, 1 15/16-in. high, in lengths of 3. 4, 5 and 6 ft. The needed lengths are placed under the conveyor belt. *Write*: Eriez Mfg. Co., Erie 6, Pa. *Phone*: 4-0133

Electronic Gage

Model 144 B-83 measures taper and outside diameters on auto pistons, then stamps a code letter on them to identify diameter.

The gage simultaneously measures the taper between the top and bottom of the piston skirt and the outside diameter at the upper end of the skirt.

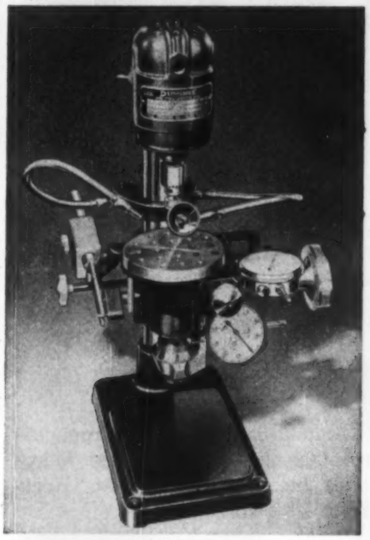
If the taper is not in tolerance,

the part is rejected. If the taper is O.K., signal lights tell the operator the diameter classification to which the piston belongs. There are six good diameters, differing by 0.0003-in., plus oversize and undersize classes. *Write*: Federal Products Corp., 1144 Eddy St., Providence 1, R. I. *Phone*: Stuart 1-9300

Precision Drilling

The Series 27 Micro-Drill speeds drilling of holes as small as 0.001-in. Collets used with the magnetic chuck take most microdrills with shank sizes of 0.030, 0.040 and 0.061-in.

A micrometer depth control is accurate within 0.0002-in.



Two-way table travel eliminates setup time and the necessity for tooling and fixturing.

Motor speed is adjustable from 0 to 17,000 rpm to give the correct speed for any drill up to ⅛-in. *Write*: Dumore Co., Racine, Wis. *Phone*: Melrose 3-8221

Filtering

The Delpark Up-Flo filter combines a permanent bar stock bronze screen and settling tank with magnetic separation.

No. 5 Alnico magnets make a flat magnetic field on which liquids are diffused. The design enables

HOW TO GET WELDED SECURITY ON THE MOST CRITICAL JOBS

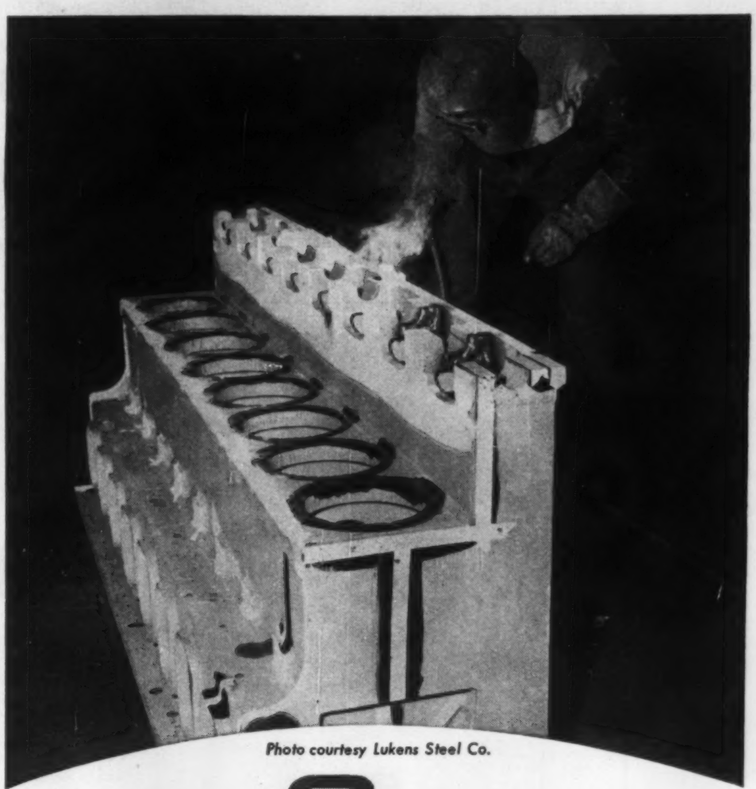
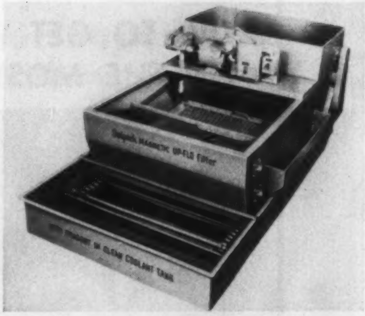


Photo courtesy Lukens Steel Co.

WELD WITH ARCOS

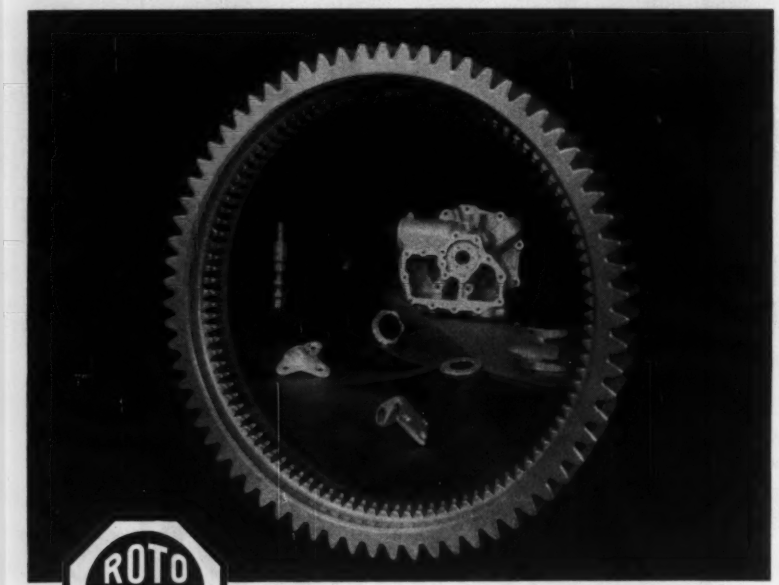
STAINLESS ELECTRODES

This Diesel engine housing—for use on a mine sweeper—is a new application for welded *stainless.* 18-8 stainless was selected for its non-magnetic properties. The unit, and many others, were completely welded with Arcos E308HC-15 low magnetic permeability coated electrodes. Why Arcos? For a reason you'll want to keep in mind: When base metal properties are critical . . . and performance requirements exacting, Arcos quality assures sound weld metal for lasting security. ARCOS CORPORATION, 1500 South 50th Street, Philadelphia 43, Pa.



gravity to assist the magnetic field.

The action carries liquids up through the permanent, 0.004-in. bar stock screen to remove particles which do not respond to the magnets. The liquid flows into a storage tank where settled particles smaller than 0.004-in. are removed by chain-driven flights. *Write*: Department UM-297, Industrial Filtration Co., Lebanon, Ind. *Phone*: 1877



ROTO FINISH

it's the finish that counts!

Roto-Finish maintains exact tolerances on precision parts with no significant dimensional changes. It makes possible a wide range of finishes applicable to parts of almost any size or shape; finishes a variety of materials — at big savings in manpower and costs. Without obligation, send sample unfinished parts to us. Include finished part for guide and your specifications. Roto-Finish will finish parts in its laboratory. You get a complete process report. You are guaranteed results and a finish that counts!

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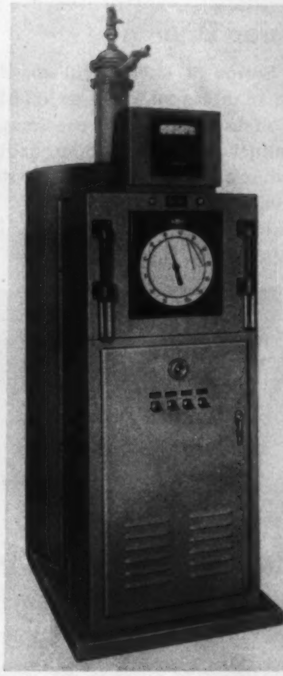
3717 Milham Road, Kalamazoo, Michigan
Originators of the Roto-Finish Process

P. O. Box 988
Phone 3-5578

Atmosphere Generator

The endothermic unit controls the dew point of the base generator gas automatically. It combines a gas-fired generator with the automatic Dewtronic recorder-controller.

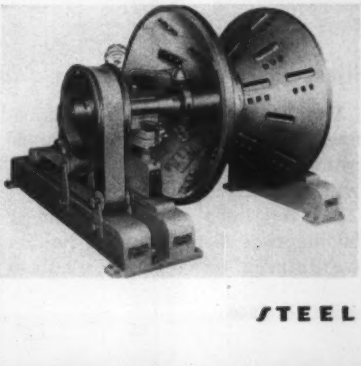


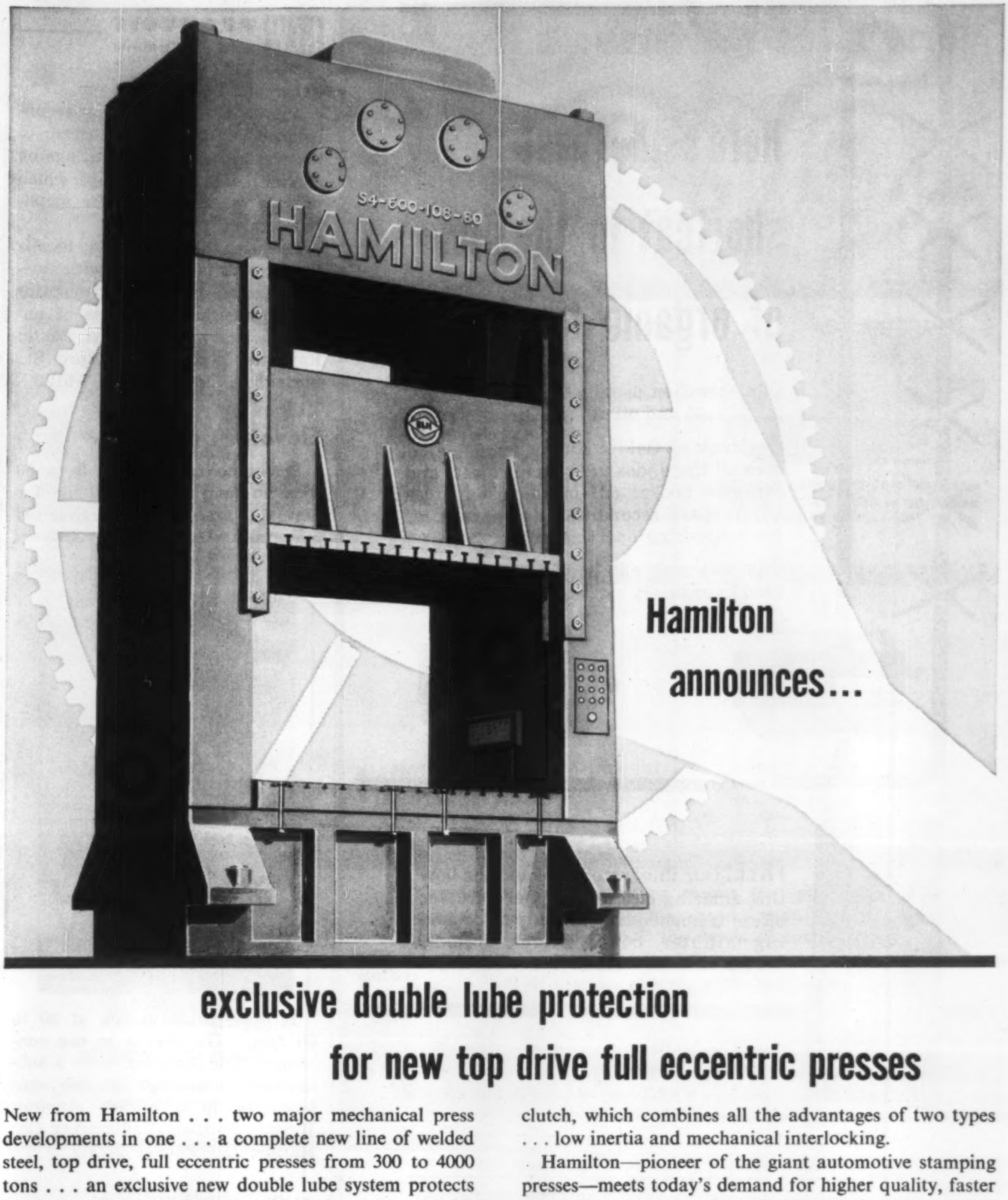
The prepared atmosphere gas is controlled within a narrow dew point range. The base gas analysis is controlled despite changing humidity and variations in analysis and pressure of the line gas. Standard sizes range from 750 to 5000 cfh. *Write*: Ipsen Industries Inc., 715 S. Main St., Rockford, Ill. *Phone*: 5-9581

Balancing Machine

The Mogul has pedestals which can be adjusted to the length of the piece to be balanced.

The drive unit can be put at





Hamilton announces...

exclusive double lube protection for new top drive full eccentric presses

New from Hamilton . . . two major mechanical press developments in one . . . a complete new line of welded steel, top drive, full eccentric presses from 300 to 4000 tons . . . an exclusive new double lube system protects each press for extra-long, trouble-free service and for smoother, precision performance.

Hamilton double lube is a combination of a carefully engineered pressure oil lubrication system PLUS a complete set of troughs and gravity flow channels to provide gravity lubrication. All bearings are positively lubricated even if pressure and flow switches should fail. Double lube is double insurance against lubrication failure—a major cause of costly downtime.

In addition, this line features Hamilton's new air clutch, which combines all the advantages of two types . . . low inertia and mechanical interlocking.

Hamilton—pioneer of the giant automotive stamping presses—meets today's demand for higher quality, faster production, less downtime. Put this know-how to work for you! Send for the full story. Write Dept 4446, Hamilton Division, BLH Corporation, Hamilton, Ohio.

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Here's the best shortcut in the field of organic finishing

One operation usually removes paint, rust and oil at the same time.

One tank of Oakite Rustripper frequently does all these jobs: (1) strip rejects and conveyor hooks; (2) pickle rusted stock; (3) prepare reconditioned products for refinishing operations.

One tank may eliminate many tanks used in ordinary cycles.

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either end or in the center.

A true seismic free-in-space unbalance indicator is attached to the work-supporting mountings on chrome balls and raceways which provide over 4 in. of free amplitude travel.

Because the ability to handle heavy loads is combined with variable power drives, the operator can correct large amounts of unbalance at low, safe speeds. *Write*: Raydyne Corp., 920 W. Laurel St., Springfield, Ill. *Phone*: 2-9122

Elevator Conveyor

Smoothflo moves from 3 to 50 tons an hour. It is suitable for flowable granular or pulverized materials which are not actively abrasive or corrosive.

It operates at speeds of 30 to 60 fpm. The flights in the continuous flow conveyor carry a substantial percentage of the unit loads as in a bucket elevator. *Write*: Fairfield Engineering Co., Marion, O. *Phone*: 2-2117

Milling and Centering

Model 3 MCT is quickly set up for lengths to 48 in. It drills to a depth of 4 in.

Two triangular fixtures with six trunnion vises index 120 degrees between three stations. In the automatic cycle, parts are loaded into the work-carrying fixture at the front of the machine, then in-

for full operating efficiency

choose a Century

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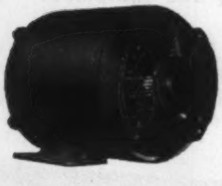
Performance-Rated to Bring Out All the Top Performance That's Engineered Into Your Equipment



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A.C., Single or Polyphase
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RIGID BASE, OPEN TYPE, PROTECTED
1 to 400 H.P.—A.C., Single or Polyphase
May be used in place of splash proof . . . screens available for rodent protection.
Send for Bulletin 6-1P1

CUSHION BASE, OPEN TYPE, PROTECTED—1/20 to 5 H.P.
A.C., Single or Polyphase
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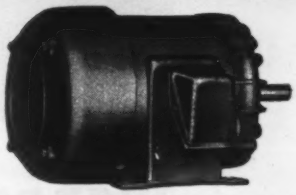

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1 to 100 H.P., A.C., Single or Polyphase
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Round, short frame—for horizontal or vertical operation
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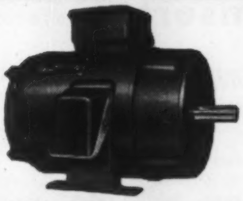

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With feet for motor-mounted equipment
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2 to 100 H.P.
UL approval Class I, "C" and "D"
Class II, "E," "F" and "G"
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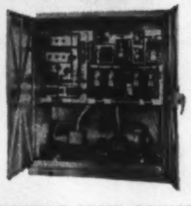

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Century Performance-Rating means that you can select precisely the right motor size, speed, frame, mounting and torque characteristics to fit the needs of each installation.

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To CENTURY ELECTRIC COMPANY, 1806 Pine Street, St. Louis 3, Mo.
Please send me the following bulletins:
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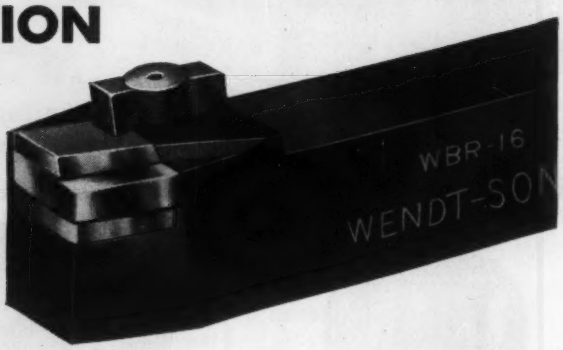
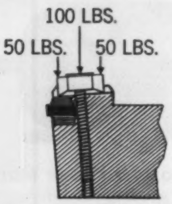
SUPERIOR CLAMPING ACTION



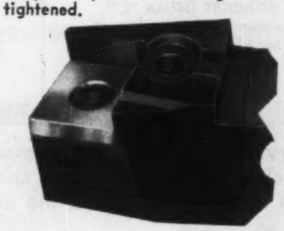
with WENDT-SONIS TOOL HOLDERS

for Throw-Away Inserts



Exclusive Wendt-Sonis clamp evenly distributes force on insert and tool body . . . holds insert more securely. Clamp or screw will not distort when tightened. Also clamp is recessed in holder body to prevent twisting when tightened.

Replaceable Carbide Shim. Insert rests on a replaceable carbide shim. Shim protects tool body from damage in event of machine or insert failure, reduces wear and chatter and gives maximum insert support.



SIMPLICITY. Only 5 separate parts. Only one screw is loosened to index insert, or add chipbreaker. Screw has socket head in both ends.

GREATER STRENGTH. Holder body is hardened steel. Clamp is forged steel held by large clamp screw. Insert is "nested" so that all cutting forces are transmitted to holder body.

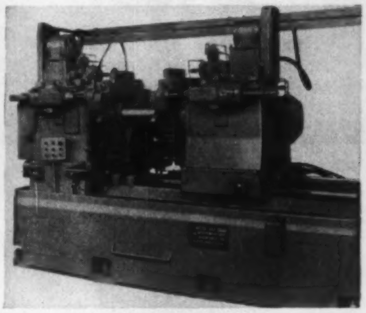
A COMPLETE LINE. Wendt-Sonis Standard and Special Mechanical Tool Holders are available for almost all operations, both right or left hand cutting. Shank sizes range from ½" square thru 1" x 1½". Holders with neutral, negative or positive rakes are available. Inserts are either precision or utility ground.

WENDT-SONIS COMPANY

Dept SM-456

HANNIBAL, MISSOURI • ROGERS, ARKANSAS

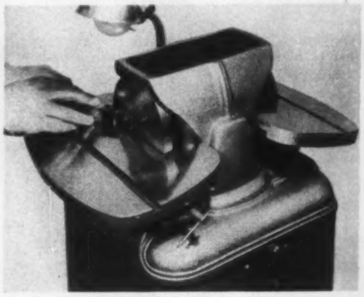
dexed to the milling and drilling stations. They go back to the front of the machine for unloading.



The single-speed milling heads are adaptable for carbide tooling. The feed rate of both milling and drilling heads is infinitely variable. *Write*: Machinery Mfg. Division, Motch & Merryweather Machinery Co., 888 E. 70th St., Cleveland 3, O. *Phone*: Utah 1-1515

Offhand Grinder

The Micro-Carbide Finisher produces superfinishes down to 1 microinch. It handles tools directly from rough grinding without the use of diamond wheels.



The finisher uses diamond-charged lapping discs. Tables are adjustable 30 degrees up and down. *Write*: Boylhart, Lovett & Dean Inc., 601 S. Rampart Blvd., Los Angeles 57, Calif. *Phone*: Dunkirk 7-8293

Furnace Linings

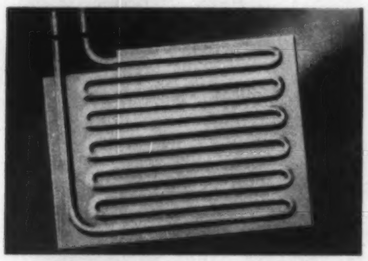
Alumag provides long lasting linings for high-frequency electric induction furnaces used in melting stainless and other high nickel and alloy steels.

The mix contains a high percentage of fused magnesia and fused alumina. *Write*: Electro Refractories & Abrasives Corp., Buffalo, N. Y. *Phone*: Washington 5259

Heat Transfer

Platecoils consist of two embossed metal sheets welded together to provide a preformed channel for the flow of heating or cooling media.

They are especially suitable for open top tanks because the fittings are at the top and can be removed for inspection or cleaning without draining the tank.

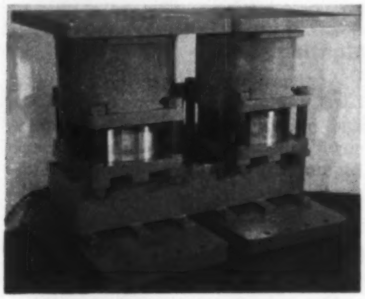


Style 50 Platecoils are available in 18 or 22-in. widths and in 23 to 119-in. lengths. *Write*: Platecoil Division, Tranter Mfg. Inc., Lansing 4, Mich. *Phone*: Ivanhoe 4-4531

Die Cushions

Model HC-24-8 (pneumatic) provides individual pressure pad control.

The all-steel unit has bronze overlay on the pistons to give maximum wear. Cylinder and piston sections have maximum overlap to compensate for off-center loading of the pin pressure pads. *Write*: Dayton Rogers Mfg. Co., 2824 13th Ave. S., Minneapolis 7, Minn. *Phone*: Pleasant 2471



WIN $2000.00 IN THE WENDT-SONIS TOOL HOLDER "CUT COSTS" CONTEST

New! Different! Interesting! Easy too . . . and you win two ways in the Wendt-Sonis "Cut Costs" Contest. Who's eligible? Anyone employed by a company using the new superior Wendt-Sonis tool holder for throw-away inserts — a proven cost cutter. Keep a record on how you did it — how you "cut costs." Enter the facts on a simple-to-fill-out entry blank — send it to Wendt-Sonis Company for a chance at the prizes. Contest closes June 30, 1956. You win two ways — a chance at the prize — your job done at lower cost with Wendt-Sonis tool holders for throw-away inserts.

briefly — here's all you do . . .

1 Use the coupon below to get your entry blank and clear-cut easy-to-understand contest rules.

2 Be sure you have Wendt-Sonis tool holders for throw-away inserts on your job.

3 Jot down the facts and figures on the job for filling in the standard entry blank. You can base your example on lower tooling costs . . . less downtime . . . more parts per hour . . . *all* of these three . . . or any other savings you accomplished with Wendt-Sonis tool holders for throw-away inserts. Don't worry about neatness, spelling or size and type of job. Enter more than one job if you wish!

Don't be concerned about our using your name or company name in advertising. We wouldn't do that without getting your permission first.

$5000.00 IN PRIZES

1st $2000.00
2nd $1000.00
3rd $ 500.00
4th $ 250.00
and 25
$50 PRIZES
for
DOING YOUR JOB BETTER . . . AT LOWER COST

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Tool Engineer

Jerome S. Wilford
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Production Magazine

Elmer J. Tangerman
Executive Editor
American Machinist

GET YOUR SIMPLIFIED ENTRY BLANK RUSH!

CLIP — mail now!

"Cut Costs" Contest
Wendt-Sonis Co.
Dept. SM-456, Hannibal, Mo.

I want a chance to win in the Wendt-Sonis Tool Holder "Cut Costs" Contest. Rush me rules and entry blank.

COUNT ME IN!

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NEW Literature

Write directly to the company for a copy

Stainless Steel Wire

A 6-page bulletin gives the analyses, tensile strengths, physical properties and gages of 12 types of stainless wire. Webb Wire Division, Carpenter Steel Co., New Brunswick, N. J.

Electroplating Control

Tank rheostats for providing voltage drop between the constant voltage direct current line and the plating tank are described in bulletin 500, 4 pages. Columbia Electric Mfg. Co., 4519 Hamilton Ave., Cleveland 14, O.

Galvanizing

A process for improving galvanizing by the use of additives is described in a 4-page bulletin. Promat Division, Poor & Co., 851 S. Market St., Waukegan, Ill.

Seam Welder

Bulletin 316-7, 6 pages, announces an air-operated, single-phase seam welder available in 50 and 75 kva at 50-per-cent duty cycle. Sciaky Bros. Inc., 4915 W. 67th St., Chicago, Ill.

Electric Fan Clutches

A 20-page technical report analyzes custom-engineered fan clutches for internal combustion engines. Warner Electric Brake & Clutch Co., Beloit, Wis.

Dust Collectors

Cabinet cloth filter and cyclone separator dust collectors are depicted in a 16-page bulletin. Department KP, Torit Mfg. Co., 287 Walnut St., St. Paul 2, Minn.

Chuck Control

Selectrons for automatic control of magnetic chucks are described in a 4-page bulletin. DoAll Co., Des Plaines, Ill.

Canmaking

A line of body makers, power formers and duplex seaming presses for medium and high speed canmaking lines is presented in section 3 of catalog 36-B, 16 pages. E. W. Bliss Co., 50 Church St., New York 7, N. Y.

Chemical Finishing

Aluminum anodizing and alodizing, surface conditioning and other conversion coatings for aluminum, magnesium and steel are described in a 12-page booklet. J. W. Rex Co., 834 W. Third St., Lansdale, Pa.

Honeycombs

Engineering data on adhesives for honeycomb structures are given in a 20-page bulletin. Adhesives & Coatings Division, Minnesota Mining & Mfg. Co., 423 Piquette Ave., Detroit 2, Mich.

Solvent Detergent

This folder tells of a metal cleaner used in power washing machines which also protects against rust. Oakite Products Inc., 134E Rector St., New York 6, N. Y.

Explosion-Proof Motors

A line of motors with NEMA frames 405 through 215 is described in a 4-page bulletin. Sterling Electric Motors Inc., 5401 Telegraph Road, Los Angeles 22, Calif.

Magnesium-Base Alloys

Official alloy nomenclature and temper designation are given in a 12-page booklet. Magnesium Association, 122 E. 42nd St., New York 17, N. Y.

Oxygen Analyzer

Operation and features of the paramagnetic Magno-Therm analyzer and electronic controller are given in a 16-page catalog, 55-829-56. Hays Corp., Michigan City, Ind.

Centrifugal Pumps, Valves

Bulletin 1055, 20 pages, gives technical data on pumps and valves for handling abrasive liquids. McNally Pittsburg Mfg. Corp., Pittsburg, Kans.

Radiant Heating

Installation of radiant heating systems is described in an 8-page bulletin. A. M. Byers Co., Box 1076, Pittsburgh 30, Pa.

Noise Control

Bulletin K6A, 9 pages, has case histories on how steel springs, cork and rubber solve vibration and noise problems. Korfund Co. Inc., 48-40E 32nd Place, Long Island City 1, N. Y.

Hydraulic Crane

Bulletin AD-2253, 8 pages, presents an indoor-outdoor crane that handles up to 10,000 lb. Construction Equipment Division, Austin - Western Works, Baldwin-Lima-Hamilton Corp., Aurora, Ill.

Diecasting Machines

An 8-page bulletin describes a unit with 400 tons of locking pressure which is furnished as either a hot or cold chamber machine. Cleveland Automatic Machine Co., Cincinnati 12, O.

Coal Handling

Equipment for screening and moving coal is depicted in bulletin 855, 52 pages. McNally Pittsburg Mfg. Corp., Pittsburg, Kans.

Control, Transfer Switches

A 28-page bulletin, GEA-4746B, covers a line of control and transfer switches for low voltage uses up to 600 volts, ac or dc. General Electric Co., Schenectady 5, N. Y.

Radioisotopes

Nearly 100 radioactive preparations are specified in a revised radioisotope catalog. Radioisotope Sales Department, Oak Ridge National Laboratory, Union Carbide Nuclear Co., P. O. Box P, Oak Ridge, Tenn.

High Strength Bolts

Practical information for the construction man using high strength bolts is given in bulletin HS-1, 20 pages. Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.

Manganese Steel Sprockets

Sprockets with replaceable tooth segments are illustrated in bulletin 1-56, 4 pages. Taylor-Wharton Division, Harrisburg Steel Corp., High Bridge, N. J.

Industrial Signals

Proper use of visual and audible signals in manufacturing plants is presented in bulletin 100, 8 pages. Department PR, Signal Division, Federal Sign & Signal Corp., 8700 S. State St., Chicago 19, Ill.

Instrument Transformers

A buyer's guide, GEC-1028, 80 pages, presents the complete instrument transformer line. General Electric Co., Schenectady 5, N. Y.

Lighting

Application engineering bulletin LD-1, 79 pages, covers the design and operation of incandescent, mercury and fluorescent light sources. Inquiry Bureau, Large Lamp Department, General Electric Co., Cleveland 12, O.

Protective Coatings

Coatings to protect against excessive moisture, dust, chemical particles and corrosive atmospheric conditions are described in an 8-page bulletin. Nukem Products Corp., 111 Colgate Ave., Buffalo 20, N. Y.

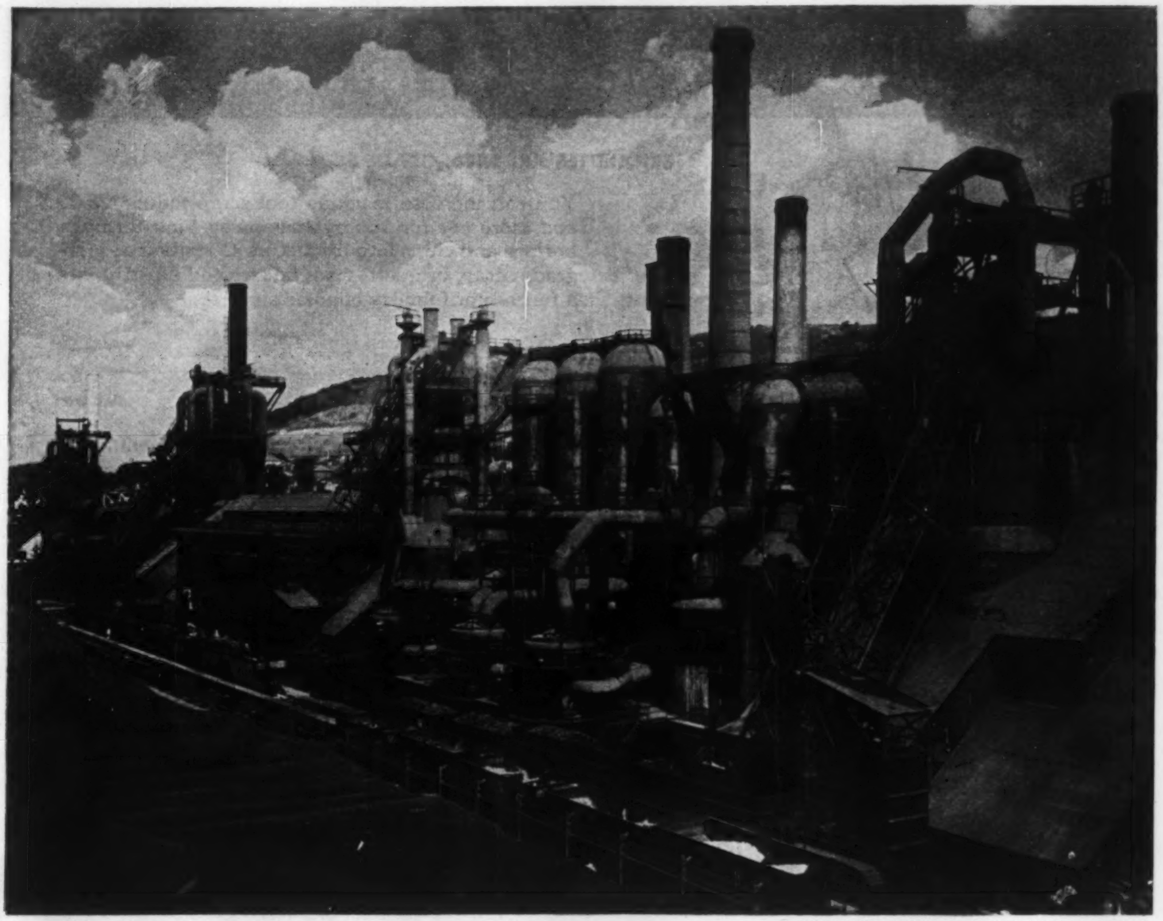


PHOTO COURTESY WEIRTON STEEL COMPANY, WEIRTON, WEST VIRGINIA.

How do you break "the capacity barrier?"

Actually there *is* a way. Without increasing plant capitalization you *can* boost iron production.

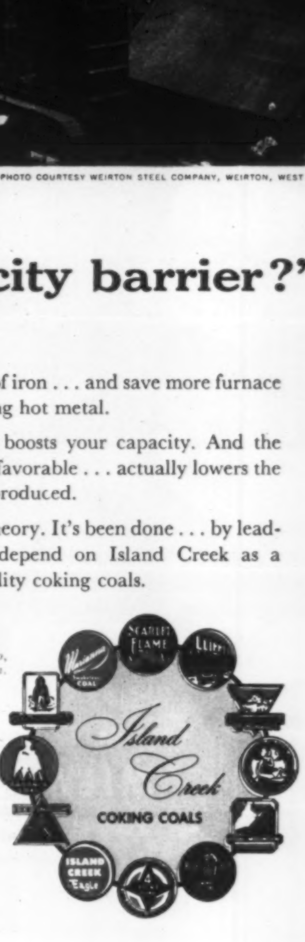
We'll leave the technical explanation up to Island Creek coking coal specialists. They'll welcome an opportunity to discuss it with you.

But the principle, itself, is just this simple. Island Creek's quality coking coals have lower ash and sulphur . . . less moisture. By using better coal, you use less coke per ton of iron . . . and save more furnace capacity for producing hot metal.

Higher efficiency boosts your capacity. And the cost picture is just as favorable . . . actually lowers the cost per ton of iron produced.

It's more than a theory. It's been done . . . by leading producers who depend on Island Creek as a major source for quality coking coals.

Island Creek coals are ideal, too, for industrial steam production.



YOU CAN DEPEND ON

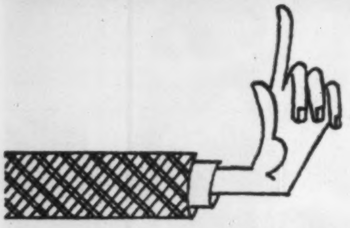
Island Creek

COKING COALS

ISLAND CREEK COAL SALES COMPANY, Chafin Building, Huntington 18, West Virginia

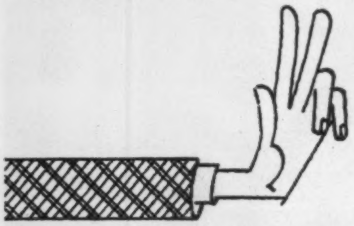
Chicago • Cincinnati • Cleveland • Detroit • Greensboro • New York • Pittsburgh

3 REASONS WHY SCRAP MEANS PROFIT . . .



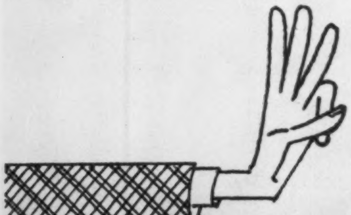
BRIQUETTES ARE HIGH-GRADE SCRAP

You can increase machine tool scrap value *$20.00 and more per ton* . . . by converting bulk turnings, borings and chips into briquettes. Classified as high-grade scrap, briquettes can be charged directly into a furnace or foundry cupola.



BRIQUETTES ARE EASIER TO HANDLE

Small and uniform in size, briquettes eliminate many scrap handling problems. Current users of Milwaukee automatic briquetting presses include leading manufacturers of automobiles, aircraft, farm implements, plumbing supplies, auto parts and other high-production items.



BRIQUETTES REQUIRE LESS STORAGE SPACE

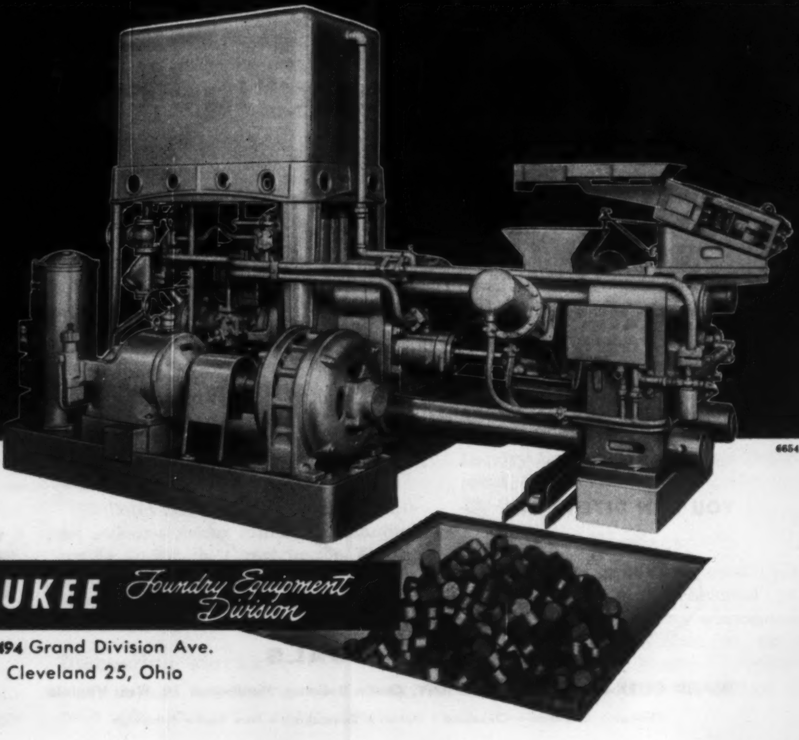
Compact briquettes also greatly reduce scrap storage space. Many users, through increased profits and savings, write off initial machine cost in the first year.

Milwaukee briquetting presses are available in six sizes... capacities range from ¾ to 3½ tons per hour.

. . . WITH A *MILWAUKEE* BRIQUETTING PRESS

MILWAUKEE
Hydraulic
Briquetting Press

For complete data and specifications, write for Bulletin 117.



6654-81

WORLD'S LARGEST SUPPLIERS
SPO
OF MOLDING MACHINES

MILWAUKEE *Foundry Equipment Division*

6494 Grand Division Ave.
Cleveland 25, Ohio

STEEL

April 16, 1956

Market Outlook

STEEL for 1957 automobiles is being ordered by suppliers of automotive parts. They are requesting June delivery.

The steel being specified is mostly for products of new designs and shapes.

Most of this requested steel tonnage is flat rolled (strip and sheet), although some is for bars.

THE CAUSE— Ordering of steel for 1957 models was stimulated when one of the Big Three auto producers advised partmakers to cover on steel against contracts for accessories now being placed in growing volume.

This ordering will renew pressure for steel. When the auto industry slowed its production early this year, demand for steel eased, although over-all requirements continued to exceed supply in most products.

TIME TO COVER— The letup by the auto industry gave other consumers an opportunity to cover some of their steel needs.

If the new autos sell as well as the manufacturers hope they will, the over-all demand for steel will far exceed supply again.

BIG BUILDUP— The construction industry wants more steel than it can get. Fabricators of structural steel are booked well into next year. Insufficient supplies of steel are preventing some fabricators from bidding on as large a portion of the available work as they normally would. The lack of steel is forcing some builders to defer or change plans. A number of jobs, particularly smaller ones, are being switched to reinforced concrete construction because of the scarcity of structural steel. The Illinois Toll Highway Commission is preparing to build a prefabricated overpass bridge as an experiment. If successful it could be duplicated on about 200 overpass bridges over sections of the projected 193 miles of toll roads in the northern part of the state.

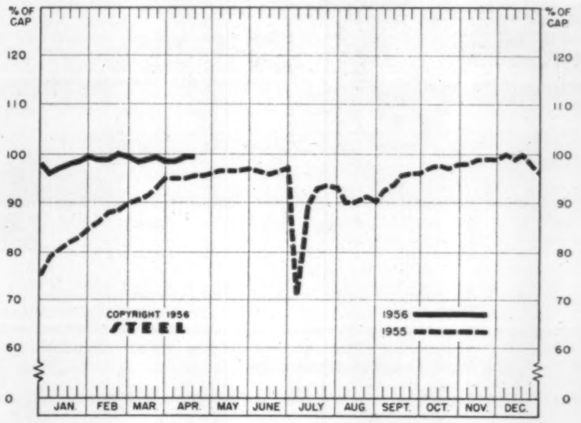
PLATE OUTLOOK— The construction industry not only is pulling heavily on the structural shape supply but also on plates. Producers expect the pressure on plates to continue all year. Heavy industrial equipment, building construction, railroad equipment, tanks and line pipe and increasing ship work are drawing heavily on the plate supply.

BUSY WAREHOUSES— Small consumers, too, are taking a lot of steel. Their suppliers—the warehouses—are doing a big volume of business. Price advances and good sales have boosted the dollar volume of some warehouses to the highest level of this year. In the Chicago area, the rate of inquiry for warehouse steel in March was 5 per cent ahead of February's, and April is running ahead of March's rate.

BUSY MILLS— The high demand for steel kept mill production of steel for ingots and castings at 99.5 per cent of capacity in the week ended Apr. 15. Capacity operations are assured for as far ahead as producers are willing to book orders. The second quarter is filled; some producers are just beginning to open books for the third quarter.

Booming steel demand and production continued to push up the prices of scrap. STEEL's price composite on steelmaking grades of scrap rose to another record high of $55.00 a ton.

NATIONAL STEELWORKS OPERATIONS



DISTRICT INGOT RATES

(Percentage of Capacity Engaged)

	Week Ended Apr. 15	Change	Same Week 1955	Same Week 1954
Pittsburgh	101.5	+ 1.5*	98	71.5
Chicago	100.5	0*	98	76.5
Mid-Atlantic	99	+ 1	95	59
Youngstown	100	— 3	96	68
Wheeling	98.5	+ 2	91.5	73
Cleveland	95.5	+ 2*	98.5	66.5
Buffalo	105	0	104.5	67.5
Birmingham	93	0	90	46
New England	85	0	82	60
Cincinnati	93.5	+ 4.5	90.5	56.5
St. Louis	99.5	+ 4.5	90	62.5
Detroit	94	— 1.5*	88	59
Western	104	0	98	80
National Rate	99.5	0	95.5	67

INGOT PRODUCTION‡

	Week Ended Apr. 15	Week Ago	Month Ago	Year Ago
INDEX (1947-1949=100)	150.3†	149.8	154.2	142.2
NET TONS (In thousands)	2,414†	2,406	2.477	2,284

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*Change from preceding week's revised rate. †Estimated. ‡Amer. Iron & Steel Institute. Weekly capacity (net tons): 2,461,893 in 1956; 2,413,278 in 1955; 2,384,549 in 1954.

Metalworking Outlook—p. 45

Technical Outlook—p. 91

Price Indexes and Composites

FINISHED STEEL PRICE INDEX (Bureau of Labor Statistics)

	Apr. 10 1956	Apr. 3 1956	Month Ago	Mar. Average
(1947-1949=100)	157.1	157.1	157.1	157.1

AVERAGE PRICES OF STEEL (Bureau of Labor Statistics)

Week Ended Apr. 10

Prices include mill base prices and typical extras and deductions. Units are 100 lb except where otherwise noted in parentheses. For complete description of the following products and extras and deductions applicable to them, write to STEEL.

Rails, Standard, No. 1	$4.800
Rails, Light, 40 lb	6.217
Tie Plates	5.625
Axles, Railway	8.350
Wheels, Freight Car, 33 in. (per wheel)	52.50
Plates, Carbon	5.209
Structural Shapes	4.867
Bars, Tool Steel, Carbon (lb)	0.460
Bars, Tool Steel Alloy, Oil Hardening Die (lb)	0.560
Bars, Tool Steel, H. R., Alloy, High Speed W 6.75, Cr 4.5, V 2.1, Mo 5.5, C 0.60 (lb)	1.185
Bars, Tool Steel, H.R., Alloy, High Speed W-18, Cr 4, V 1 (lb)	1.680
Bars, H.R., Alloy	9.425
Bars, H.R., Stainless, 303 (lb)	0.450
Bars, H.R., Carbon	5.500
Bars, Reinforcing	5.313
Bars, C.F., Carbon	8.800
Bars, C.F., Alloy	12.275
Bars, C.F., Stainless, 302 (lb)	0.475
Sheets, H.R., Carbon	5.345
Sheets, C.R., Carbon	6.214
Sheets, Galvanized	7.770
Sheets, C.R., Stainless 302 (lb)	0.588
Sheets, Electrical	$10.175
Strip, C.R., Carbon	8.243
Strip, C.R., Stainless, 403 (lb)	0.444
Strip, H.R., Carbon	5.606
Pipe, Black, Buttweld (100 ft)	16.997
Pipe, Galv., Buttweld (100 ft)	21.137
Pipe, Line (100 ft)	167.250
Casing, Oil Well, Carbon (100 ft)	165.120
Casing, Oil Well, Alloy (100 ft)	244.670
Tubes, Boiler (100 ft)	39.470
Tubing, Mechanical, Carbon	21.133
Tubing, Mechanical Stainless, 304 (100 ft)	178.897
Tin plate, Hot-dipped, 1.25 lb	8.933
Tin Plate, Electrolytic, 0.25 lb	7.633
Black Plate, Canmaking Quality	6.733
Wire, Drawn, Carbon	8.575
Wire, Drawn, Stainless 430 (lb)	0.590
Bale ties (bundle)	6.537
Nails, Wire, 8d Common	8.693
Wire, Barbed (80-rod spool)	7.847
Woven Wire Fence (20-rod roll)	18.635

STEEL's FINISHED STEEL PRICE INDEX*

	Apr. 11 1956	Week Ago	Month Ago	Year Ago	5 Yrs. Ago
Index (1935-39 av.=100)	209.10	209.10	209.10	194.53	171.92
Index in cents per lb	5.665	5.665	5.665	5.270	4.657

STEEL's ARITHMETICAL PRICE COMPOSITES

Finished Steel, NT*	$128.02	$128.02	$128.02	$118.45	$106.32
No. 2 Fdry Pig Iron, GT	60.06	60.06	58.99	56.54	52.54
Basic Pig Iron, GT	59.61	59.61	58.49	56.04	52.16
Malleable Pig Iron, GT	61.06	61.06	59.77	57.27	53.27
Steelmaking Scrap, GT	55.00	54.17	49.17	37.41	44.00

*For explanation of weighted index see STEEL, Sept. 19, 1949, p. 54; of arithmetical price composite, STEEL, Sept. 1, 1952, p. 130

Comparison of Prices

Comparative prices by districts, in cents per pound except as otherwise noted. Delivered prices based on nearest production point.

FINISHED STEEL	Apr. 11 1956	Week Ago	Month Ago	Year Ago	5 Yrs. Ago
Bars, H.R., Pittsburgh	4.65	4.65	4.65	4.30	3.70
Bars, H.R., Chicago	4.65	4.65	4.65	4.30	3.70
Bars, H.R., deld. Philadelphia	4.93	4.93	4.93	4.55	4.20
Bars. C.F., Pittsburgh	6.25*	6.25*	6.25*	5.40	4.55
Shapes, Std., Pittsburgh	4.60	4.60	4.60	4.25	3.65
Shapes, Std., Chicago	4.60	4.60	4.60	4.25	3.65
Shapes, deld., Philadelphia	5.00	5.00	5.00	4.53	3.91
Plates, Pittsburgh	4.50	4.50	4.50	4.225	3.70
Plates, Chicago	4.50	4.50	4.50	4.225	3.70
Plates, Coatesville, Pa.	4.80	4.80	4.80	4.225	4.15
Plates, Sparrows Point, Md.	4.50	4.50	4.50	4.225	3.70
Plates, Claymont, Del.	4.80	4.80	4.80	4.225	4.15
Sheets, H.R., Pittsburgh	4.325	4.325	4.325	4.05	3.60-3.75
Sheets, H.R., Chicago	4.325	4.325	4.325	4.05	3.60
Sheets, C.R., Pittsburgh	5.325	5.325	5.325	4.95	4.35
Sheets, C.R., Chicago	5.325	5.325	5.325	4.95	4.35
Sheets, C.R., Detroit	5.325-5.425	5.325-5.425	5.325-5.425	5.10	4.55
Sheets, Galv., Pittsburgh	5.85	5.85	5.85	5.45	4.80
Strip, H.R., Pittsburgh	4.325	4.325	4.325	4.05	3.75-4.00
Strip, H.R., Chicago	4.325	4.325	4.325	4.05	3.50
Strip, C.R., Pittsburgh	6.25	6.25	6.25	5.75	4.65-5.35
Strip, C.R., Chicago	6.25-6.35	6.25-6.35	6.25-6.35	5.85	4.90
Strip, C.R., Detroit	6.35	6.35	6.35	5.90	4.35-5.60
Wire, Basic, Pittsburgh	6.60	6.60	6.60	5.75	4.85-5.10
Nails, Wire, Pittsburgh	7.60	7.60	7.60	6.85	5.90-6.20
Tin plate (1.50 lb), box, Pitts.	$9.45	$9.45	$9.45	$9.05	$8.70

*Including 0.35c for special quality

SEMIFINISHED STEEL

Billets, Forging, Pitts. (NT)	$84.50	$84.50	$84.50	$78.00	$66.00
Wire rods, $\frac{7}{32}$-⅝" Pitts.	5.375	5.375	5.375	4.675	4.10-4.30

PIG IRON, Gross Ton

Bessemer, Pitts.	$61.00	$61.00	$59.50	$57.00	$53.00
Basic Valley	60.00	60.00	58.50	56.00	52.00
Basic, deld. Phila.	63.76	63.76	62.16	59.66	56.49
No. 2 Fdry, Pitts.	60.50	60.50	59.00	56.50	52.50
No. 2 Fdry, Chicago	60.50	60.50	59.00	56.50	52.50
No. 2 Fdry, Valley	60.50	60.50	59.00	56.50	52.50
No. 2 Fdry, deld. Phia.	64.26	64.26	62.66	55.16	56.99
No. 2 Fdry, Birm.	55.00	55.00	55.00	52.88	48.88
No. 2 Fdry (Birm.) deld. Cin.	62.70	62.70	62.70	60.58	55.33
Malleable, Valley	60.50	60.50	59.00	56.50	52.50
Malleable, Chicago	60.50	60.50	59.00	56.50	52.50
Ferromanganese, Duquesne.	215.00†	215.00†	205.00†	190.00†	188.00*

†74-76% Mn, net ton. *75-82% Mn, gross ton, Etna, Pa.

SCRAP, Gross Ton (Including broker's commission)

No. 1 Heavy Melt, Pitts.	$54.50	$54.50	$48.50	$38.50	$45.00
No. 1 Heavy Melt, E. Pa.	56.00	53.50	50.00	37.75	43.50
No. 1 Heavy Melt, Chicago	54.50	54.50	49.00	36.00	43.50
No. 1 Heavy Melt, Valley	58.50	58.50	52.50	37.50	45.00
No. 1 Heavy Melt, Cleve.	57.50	56.00	50.50	35.00	44.00
No. 1 Heavy Melt, Buffalo.	55.50	52.50	47.50	32.50	44.00
Rails, Rerolling, Chicago	72.50	72.50	66.50	52.50	52.50
No. 1 Cast, Chicago	51.50	51.50	48.50	41.50	49.00

COKE, Net Ton

Beehive, Furn, Connlsvl.	$14.125	$14.125	$14.125	$13.75	$14.75
Beehive, Fdry, Connlsvl.	16.50	16.50	16.50	16.75	17.50
Oven, Fdry, Chicago	27.00	27.00	27.00	24.50	21.00

Daily Nonferrous Price Record

	Price Apr. 11	Last Change	Previous Price	Mar. Avg.	Feb. Avg.	Apr. 1955 Avg.
Copper	46.00–51.00	Mar. 31, 1956	46.00–50.50	49.727	48.076	36.000
Lead	15.80	Jan. 13, 1956	16.30	15.800	15.800	14.800
Zinc	13.50	Jan. 6, 1956	13.00	13.500	13.500	11.927
Tin	99.25	Apr. 11, 1956	99.125	100.606	100.908	91.458
Nickel	64.50	Nov. 24, 1954	60.00	64.500	64.500	64.500
Aluminum	25.90	Mar. 29, 1956	24.40–25.90	24.650	24.400	23.200
Magnesium	32.50	Aug. 16, 1955	28.50	32.500	32.500	28.500

Quotations in cents per pound based on: COPPER, deld. Conn. Valley; LEAD, common grade, deld. St. Louis; ZINC, prime western, E. St. Louis; TIN, Straits, deld. New York; NICKEL, electrolytic cathodes, 99.9%, base size at refinery, unpacked; ALUMINUM, primary ingots, 99 + %, deld.; MAGNESIUM, pig, 99.8%, Freeport, Tex.

What You Can Use the Markets Section for:

- **A source of price information.**
  Current prices are reported each week. Price changes are shown in italics. Price trends are shown in tables of indexes and comparisons.
- **A directory of producing points.**
  Want to know who makes something, or where it is made? The steel price tables alphabetically list the cities of production and indicate the producing company. If you are a buyer, you may want to make a map showing comparative distances of sources of supply and to help you compute freight costs. If you are a seller of supplies you can make a map to spot your sales possibilities.
- **A source of price data for making your own comparisons.**
  Maybe you want to keep a continuous record of price spread between various forms of steel. You can get your base price information from STEEL's price tables.
- **A source of information on market trends.**
  Newsy items tell you about the supply-demand situation of materials, including iron and steel, nonferrous metals and scrap. Other articles analyze special situations of interest and importance to you.
- **Reports on iron and steel production, and materials and product shipments.**

The sturdy Taylor Velocipede frame of 2-inch mild steel tubing is braze-welded on this fixture, with ⅛-inch Anaconda-997 (Low Fuming) Bronze Welding Rod, using the oxyacetylene flame-fluxing process.

"...quickest, most dependable, most economical..."

"Braze Welding with Anaconda 997 (Low Fuming) Bronze Welding Rod is the most practical method of joining steel tubing," The Frank F. Taylor Co.

The strategically placed braze welds on Taylor Velocipedes have smooth contours, a good basis for a fine finish—and high strength to stand up in the hardest service. The Frank F. Taylor Co. also makes the famous Taylor-Tot, standard equipment in most young families.

"By depositing smooth flowing and low fuming weld metal, Anaconda-997 (Low Fuming) Bronze Welding Rods promote faster, more uniform work—providing the quickest, most dependable, most economical method of joining steel tubing," says The Frank F. Taylor Company of Norwood, Ohio.

Anaconda 997 (Low Fuming) Bronze is a superior braze-welding rod widely used for the joining of steel, cast iron, and copper alloys by the oxyacetylene process. It is also used to deposit bearing surfaces on steel and iron. Anaconda Welding Rods are sold by distributors of welding equipment everywhere, such as O.K.I. Welding Company, Cincinnati, Ohio, which supplies The Frank F. Taylor Company.

See your Anaconda distributor for help in selecting the exact rod for your job. Or write for Publication B-13. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Company Ltd., New Toronto, Ont.

56108

ANACONDA® **WELDING RODS**

Nonferrous Metals

Government purchases of zinc helped keep inventories from building in March. ODM is keeping the Townsend report on nickel hidden under a security label

Nonferrous Metal Prices, Pages 132 & 133

THE General Services Administration's willingness to enter the market for stockpile purchases of zinc kept inventories from growing out of proportion in March.

The American Zinc Institute reports that production reached a near record peak of 91,690 tons last month. Last December, all previous records were smashed when 92,578 tons were produced.

Rundown—As had been expected, the government's take for stockpile jumped to the highest level since May, 1955. A total of 6821 tons were shipped to the U. S. The result: Stock totals for the last two months varied only slightly (March, 40,038; February, 39,833).

Special high grade stocks rose from 6622 tons at the end of February to 7574 tons on Mar. 31. Prime western stocks (42,200 tons produced) were reduced 1947 tons from the previous month.

Bright Future—There was another good omen. Unfilled orders, which had been nose diving since January, turned an about-face and climbed to a total of 53,070 tons. Figure at the end of February: Only 45,255 tons.

With the government willing to enter the market and unfilled orders growing, there is little concern about what kind of second quarter the zinc industry will have so long as the Motor City enters the market within the next few weeks.

Lead, Too—Lead sales in April are running ahead of totals in January and February. It appears that the battery industry is beginning to roll in anticipation of peak demand during the coming months. "But," says an industry spokesman, "we will have no trouble filling all orders."

Nickel: Rumors Grow

The word is leaking out of Washington that the long awaited Townsend report on nickel has been completed but is being hidden under a security label. It is reported that the Office of Defense Mobilization will make part of the findings available "at the right time." Many long-time nickel men are wondering who was interviewed. There are indications that much of the researchers' time was spent in Washington with Department of Commerce officials rather than with industry.

Meanwhile, Rep. John W. McCormack (Dem., Mass.) has asked ODM several questions. All industry would like to have the answers. A few of them: How have the stockpile objectives been set? By whom? When last reviewed? What consideration has been given to the fact that the source (principally Canada) is virtually domestic and free from being cut off?

STEEL's Metal Price Averages for Mar., 1956

(Cents per lb)

Electrolytic Copper, deld. Connecticut	49.727
Lead, St. Louis	15.800
Prime Western Zinc, E. St. Louis, Ill.	13.500
Straits Tin, New York	100.606
Primary Aluminum Ingots, deld.	24.650
Magnesium, Freeport, Tex.	32.500
Nickel, f.o.b. refinery	64.500

Congressman McCormack asked many more questions. They may be found in the *Congressional Record,* Mar. 15.

Aluminum: Price Murmur

A scattering of independent extruders is lamenting that the aluminum industry should have made a price hike based on percentages rather than an across-the-board, 1.5-cent-a-pound increase.

Some extruders point out that while pig aluminum was raised about 7 per cent, fabricated products were jumped only about 4 per cent a pound. This, contend a few independents, is cutting their margins. Independent extruders sometimes reduce their own margins by underbidding the large integrated fabricators. It boils down to this: If the primary producers had raised prices on a percentage basis, fabricated products would be selling for about 3 cents more a pound. This would allow the independents to undersell the primary integrated producers and still receive additional revenue.

There is little cause for concern over price increases. Aluminum users, including the vast majority of independent extruders, agree that the aluminum industry must have more expansion capital. Some users have expressed surprise that the prices did not go higher.

Aluminum Co. of America will build an alumina plant costing more than $45 million on a site adjacent to its primary aluminum smelter at Point Comfort, Tex. Frank L. Mages, executive vice president of Alcoa, says that the new plant will produce more than 500,000 tons of alumina for the company's primary smelters.

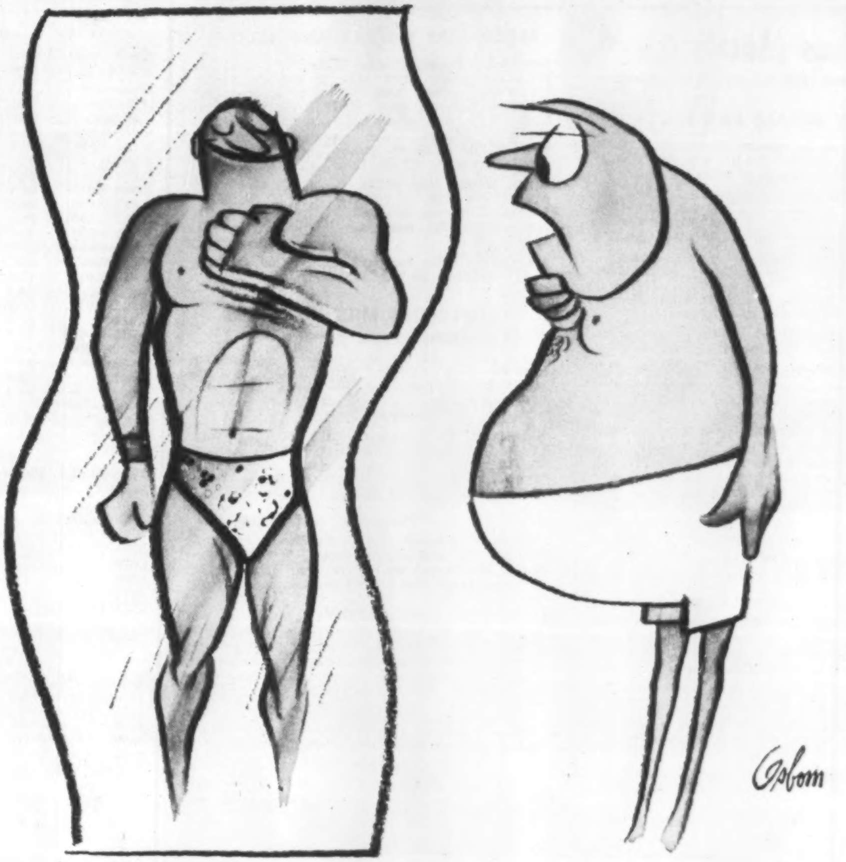
Copper Demand Slackening?

The copper market was continuing its decline until news of a strike at the Mufulira Mine in Northern Rhodesia reached the London Metal Exchange last Monday. Prices went from about 48 cents a pound to slightly over 49 cents. The strike, which affected some 1300 European workers who are objecting to the plan for advancing African workers, lasted only 41 hours. The LME reacted quickly. Prices dropped below the 48-cent level as soon as word was received that the Europeans were back on their jobs. According to the American Bureau of Metal Statistics, the Mufulira mine produced 102,264 net tons of blister copper in 1954. Africa is still the most explosive spot in the world copper picture and the one most likely to cause serious trouble in the long-term supply of the red metal.

Last Monday, secondary smelters, who had been keeping a wary eye on declining LME prices and falling scrap prices, were probably tempted to drop the 51-cent-a-pound quotation for the custom smelted red metal. But with the strike news, they held the line. Outlook: There is a growing feeling that European demand for copper is ebbing. If peak production continues, the worst could be over. The last hurdle to be overcome before supply and demand can possibly come into balance—labor negotiations—may be insurmountable.

Tin Price Rise?

The tin market is headed for higher prices, say some observers. Reason: The Middle East crisis. It is felt that there is at least a possibility the Suez canal might be closed if a hot war develops. Tin prices are still hovering around the 99-cent-a-pound mark. Other industry spokesmen indicate that tin prices will remain high until the U. S. takes final action on its Texas City tin smelter.



DISTORTION

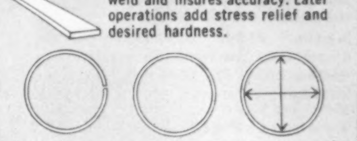
in circular parts means costly hold-ups on your production lines. End this downtime with metallurgically accurate Cleve-Weld welded parts.

Cleve-Weld Process insures accuracy in circular parts

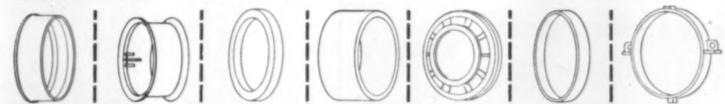
Cleve-Weld can meet exacting specifications, like those for jet engine rings, because it has the *knowledge, experience* and *facilities.* Modern equipment like oil-quench and hydraulic presses, and under- and over-fired gas furnaces help Cleve-Weld prevent distortion and insure metallurgical accuracy in circular parts.

Put Cleve-Weld's 45 years of *design, metallurgical and production experience* to work to cut your costs. See for yourself how the Cleve-Weld Process can give you accuracy while it *cuts your costs three ways compared to bulky cast or forged parts.* Write or send drawings to Circular Welded Products Sales Department.

THIS IS THE BASIC CLEVE-WELD PROCESS. Rectangular bars or special contoured sections of steel are rolled into a circular form. Next, the part is welded and then expanded into a true circle. This tests the weld and insures accuracy. Later operations add stress relief and desired hardness.



EXAMPLES OF CLEVE-WELD PROCESS PRODUCTS



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AMERICAN MACHINE & FOUNDRY COMPANY
Cleveland 7, Ohio

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Please send me your brochure on the cost-cutting Cleve-Weld Process.

Name______________________________

Title______________________________

Attach to your company letterhead and mail

Nonferrous Metals

Cents per pound, carlots, except as otherwise noted

PRIMARY METALS AND ALLOYS

Aluminum: 99 + %, ingots, 25.90; pigs, 24.00, 10,000 lb or more, f.o.b. shipping point. Freight allowed on 500 lb or more.

Aluminum Alloy: No. 13, 12% Si, 27.70; No. 43, 5% Si, 27.50; No. 142, 4% Cu, 1.5% Mg, 2% Ni, 29.70; No. 195, 4.5% Cu, 0.8% Si, 29.10; No. 214, 3.8% Mg, 29.30; No. 356, 7% Si, 0.3% Mg, 27.70.

Antimony: R.M.M. brand, 99.5%, 33.00; Lone Star brand, 33.50, f.o.b. Laredo, Tex., in bulk. Foreign brands, 99.5%, 27.00-28.00, New York, duty paid, 10,000 lb or more.

Beryllium: 97%, lump or beads, $71.50 per lb, f.o.b. Cleveland or Reading, Pa.

Beryllium Aluminum: 5% Be, $74.75 per lb of contained Be, f.o.b. Reading, Pa., Elmore, O.

Beryllium Copper: 3.75-4.25% Be, $43 per lb of contained Be, with balance as Cu at market price on shipment date, f.o.b. Reading, Pa., or Elmore, O.

Bismuth: $2.25 per lb ton lots.

Cadmium: Sticks and bars, $1.70 per lb deld.

Cobalt: 97-99%, $2.60 per lb for 550-lb keg; $2.62 per lb for 100-lb case; $2.67 per lb under 100 lb.

Columbium: Powder, $119.20 per lb, nom.

Copper: Electrolytic, 46.00 deld. Conn. Valley; 46.00 deld. Midwest: custom smelter, 50.00 deld.; Lake, 46.00 deld.; Fire refined, 45.75 deld.; Chilean electrolytic, 48.19 deld.

Germanium: First reduction, $201.85-$220 per lb; intrinsic grade, $220-$242.67 per lb, depending on quantity.

Gold: U. S. Treasury, $35 per oz.

Indium: 99.9%, $2.25 per troy oz.

Iridium: $100-$110 nom. per troy oz.

Lead: Common, 15.80; chemical, 15.90; corroding, 15.90, St. Louis. New York basis, add 0.20.

Lithium: 99 +, cups or ingots, $11.50; rod $13.50; shot or wire, $14.50, f.o.b. Minneapolis, 100 lb lots.

Magnesium: Pig, 32.50 f.o.b. Velasco, Tex.; ingot, 33.25 f.o.b. Velasco, Tex.

Magnesium Alloys: AZ91B (diecasting), 31.00 deld.; AZ63A, AZ92A, AZ91C (sand castings), 36.00 f.o.b. Velasco, Tex.

Mercury: Open market, spot, New York, $262-$264 per 76-lb flask.

Molybdenum: Powder, 99% hydrogen reduced, $3.20 per lb; pressed ingot, $4.06 per lb; sintered ingot, $5.53 per lb.

Nickel: Electrolytic cathodes, sheets (4 x 4 in. and larger), unpacked, 64.50; 10-lb pigs, unpacked, 67.65; "XX" nickel shot, 69.00; "F" nickel shot or ingots for addition to cast iron, 64.50; prices f.o.b. Port Colborne, Ont., including import duty. New York basis, add 0.92.

Osmium: $80-$100 per troy oz nom.

Palladium: $23-$24 per troy oz.

Platinum: $97-$111 per troy oz from refineries.

Radium: $16-$21.50 per mg radium content, depending on quantity.

Rhodium: $118-$125 per troy oz.

Ruthenium: $45-$55 per troy oz.

Selenium: 99.5%, $13.50-$15.50 per lb.

Silver: Open market, 91.00 per troy oz.

Sodium: 16.50, c.l.; 17.00 l.c.l

Tantalum: Sheet, rod, $68.70 per lb; powder, $56.63 per lb.

Tellurium: $1.50-$1.75 per lb.

Thallium: $12.50 per lb.

Tin: Straits, N. Y., spot and prompt, 99.25.

Titanium: Sponge, 99.3+%, grade A-1 ductile (0.3% Fe max), $3.45; grade A-2 (0.5% Fe max), $3.15 per pound.

Tungsten: Powder, 98.8%, carbon reduced, 1000-lb lots, $450 per lb, nom, f.o.b. shipping point; less than 1000 lb add 15.00; 99 +% hydrogen reduced, $5.00. Treated ingot, $6.70.

Zinc: Prime Western, 13.50; brass special, 13.75; intermediate, 14.00, East St. Louis, freight allowed over 0.50 per pound. High grade, 14.85; special high grade, 15.25 deld. Diecasting alloy ingot No. 3, 18.00; No. 2, 19.00; No. 5, 18.50, deld.

Zirconium: Ingots, commercial grade, $14.40 per lb; low-hafnium reactor grade, $23.07. Sponge, commercial grade, $7.50-$10.00 per lb, depending on quantity; reactor grade, $14.00-$22.00 per lb, depending on quantity. Powder, electronics grade, $15 per lb; flash grade, $11.50.

(Note: Chromium, manganese and silicon metals are listed in ferroalloy section.)

SECONDARY METALS AND ALLOYS

Aluminum Ingot: Piston alloys, 30.00-31.00; No. 12 foundry alloy (No. 2 grade), 30.00; 5% silicon alloy, 0.60 Cu max, 31.50-31.75; 13 alloy, 0.60 Cu max, 31.50-31.75; 195 alloy, 31.50-31.75; 108 alloy, 29.75-30.00. Steel deoxidizing grades, notch bars, granulated or shot: Grade 1, 30.00; grade 2, 29.00; grade 3, 28.25; grade 4, 27.75.

Brass Ingot: Red brass, No. 115, 44.00; tin bronze, No. 225, 58.00; No. 245, 50.75; high-leaded tin bronze, No. 305, 47.75; No. 1 yellow, No. 405, 34.75; manganese bronze, No. 421, 39.25.

Magnesium Alloy Ingot: AZ63A, 34.00; AZ91B, 34.00; AZ91C, 34.00; AZ92A, 34.00.

NONFERROUS MILL PRODUCTS

BERYLLIUM COPPER

(Base prices per lb, plus mill extras, 2000 to 5000 lb, f.o.b. Temple, Pa.; nominal 1.9% Be alloy) Strip, $1.92; rod, bar, wire, $1.89.

COPPER WIRE

Bare, soft, f.o.b. eastern mills, 30,000-lb lots, 51.355-52.85; l.c.l., 51.98-53.48. Weatherproof, 30,000-lb lots, 48.28-49.40; l.c.l., 49.03-50.15. Magnet wire deld., 15,000 lb or more, 58.68-60.26; l.c.l., 59.43-61.01.

LEAD

(Prices to jobbers, f.o.b. Buffalo, Cleveland, Pittsburgh) Sheets, full rolls, 140 sq ft or more, $21.50 per cwt; pipe, full coils, $21.50 per cwt; traps and bends, list prices plus 30%.

TITANIUM

(Prices per lb, 10,000 lb and over, f.o.b. mill) Sheets, $13.10-$13.60; sheared mill plate, $10.50-$12.00; strip, $13.10-$13.60; wire, $9.50-$11.50; forging billets, $7.90-$8.15; hot-rolled and forged bars, $7.90-$8.15.

ZINC

(Prices per lb, c.l., f.o.b. mill) Sheets, 24.00; ribbon zinc in coils, 21.50; plates, 20.00.

ZIRCONIUM

Plate, $22; H.R. strip, $19; C.R. strip, $29; forged or H.R. bars, $17; wire, 0.015 in., 1.00c per linear foot.

NICKEL, MONEL, INCONEL

	"A" Nickel	Monel	Inconel
Sheets, C.R.	102	83	99
Strip, C.R.	102	92	125
Plate, H.R.	97	87	95
Rod, Shapes, H.R. ..	87	74	93
Seamless Tubes	122	110	153

ALUMINUM

Screw Machine Stock: 30,000 lb base.

Diam. (in.) or across flats	Round 2011-T3	Round 2017-T4	Hexagonal 2011-T3	Hexagonal T2017-T4
Drawn				
0.125	69.4	67.9	...	...
0.156-0.172	59.0	57.4	...	...
0.188	59.0	57.4	...	73.2
0.219-0.234	56.0	54.4	...	...
0.250-0.281	56.0	54.4	...	69.9
0.313	56.0	54.4	...	66.7
Cold-finished				
0.375-0.547	54.9	52.9	65.2	62.8
0.563-0.688	54.9	52.9	62.1	59.0
0.750-1.000	53.6	51.6	56.9	55.7
1.063	53.6	51.6	...	53.8
1.125-1.500	51.6	49.7	55.1	53.8
Rolled				
1.563	50.3	48.4	...	...
1.625-2.000	49.7	47.7	...	52.0
2.125-2.500	48.5	46.5	...	...
2.563-3.375	47.1	45.1	...	...

ALUMINUM

Sheet and Circle: 1100 and 3003 mill finish (30,000 lb base; freight allowed)

Thickness Range Inches	Flat Sheet	Flat Sheet Circles*	Coiled Sheet	Coiled Sheet Circles†
0.249-0.136	37.5	42.3	...	...
0.135-0.096	38.0	43.2	...	...
0.095-0.077	38.7	44.2	36.1	41.3
0.076-0.061	39.3	45.1	36.3	41.5
0.060-0.048	39.9	45.6	36.7	42.0
0.047-0.038	40.4	46.5	37.2	42.4
0.037-0.030	40.8	47.0	37.6	43.1
0.029-0.024	41.4	47.5	37.9	43.6
0.023-0.019	42.2	49.0	38.8	44.5
0.018-0.017	43.0	...	39.4	45.4
0.016-0.015	43.9	...	40.2	46.6
0.014	44.9	...	41.2	47.9
0.013-0.012	46.1	...	41.9	48.9
0.011	47.1	...	43.1	50.5
0.010-0.0095	48.4	...	44.3	52.2
0.009-0.0085	49.7	...	45.8	54.3
0.008-0.0075	51.3	...	47.0	56.1
0.007	52.8	...	48.5	58.4
0.006	54.4	...	49.9	63.4

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*48 in. max diam. †26 in. max diam.

ALUMINUM

Plates and Circles: Thickness 0.250-3 in., 24-60 in. width or diam, 72-240 in. lengths.

Alloy	Plate Base	Circle Base
1100-F, 3003-F	36.5	40.8
5050-F	37.6	41.9
3004-F	38.6	43.8
5052-F	39.9	45.2
6061-T6	41.1	46.0
2024-T4*	43.6	49.9
7075-T6*	51.4	58.5

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*24-48 in. widths or diam, 72-180 lengths.

ALUMINUM

Forging Stock: Round, Class 1, 40.60-51.60 in specific lengths 36-144 in., diameters 0.375-8 in. Rectangles and squares, Class 1, 44.50-57.70 in random lengths, 0.375-4 in. thick, width 0.750-10 in.

Pipe: ASA schedule 40, alloy 6063-T6, 20-ft length, plain ends, 90,000-lb base, per 100 ft.

Nom. Pipe Size (in.)		Nom. Pipe Size (in.)	
¾	$16.85	2	$ 51.95
1	26.50	4	143.00
1¼	35.85	6	256.70
1½	42.90	8	386.30

MAGNESIUM

Sheet and Plate: AZ31A standard grade, .032 in., 99.00; .064 in., 78.00; .125 in., 63.50; .250-2.0 in., 61.00. AZ31A special grade, .032 in., 145.00; .064 in., 100.00; .125 in., 83.00; .250-2.0 in., 79.00. Tread plate, .125 in., 68.00; .250-3.0 in., 64.00. Tooling plate, .250-3.0 in., 65.00.

Extrusions		Com. Grade (FS)	Spec. Grade (AZ31B)
1 in. diam. rod		61.50	73.00
Shapes:	0.3 lb/ft	65.40-72.40	76.90-83.90
	1.0 lb/ft	61.90-67.30	73.40-78.80
	4.0 lb/ft	57.70-62.20	69.20-73.70
2 in. OD x ⅛ in. w. tubing		74.50	86.00

NONFERROUS SCRAP

DEALERS BUYING PRICES

(Cents per pound, New York, in ton lots)

Aluminum: 1100 clippings, 21.00; old sheets, 18.00; borings and turnings, 11.50-12.50; crankcases, 18.00; industrial castings, 18.00.

Copper and Brass: No. 1 heavy copper and wire, 41.50; No. 2 heavy copper and wire, 39.00; light copper, 36.00; No. 1 composition red brass, 31.00-31.50; No. 1 composition turnings, 30.00-30.50; yellow brass turnings,

BRASS MILL PRICES

	MILL PRODUCTS a				SCRAP ALLOWANCES f		
	Sheet, Strip, Plate	Rod	Wire	Seamless Tube	Clean Heavy	Rod Ends	Clean Turnings
Copper	67.13–68.63b	64.36–65.86c	....	67.32–68.82	43.500	43.500	42.750
Yellow Brass	55.60–56.50	45.65–46.58d	56.14–57.14	58.51–59.51	32.250	32.000	29.875
Low Brass, 80%.....	60.15–61.35	60.09–61.29	60.69–61.89	62.96–64.16	36.625	36.375	35.875
Red Brass, 85%.....	61.79–63.07	61.73–63.01	62.33–63.61	64.60–65.88	38.250	38.000	37.500
Com. Bronze, 90%...	63.98–65.33	63.92–65.27	64.52–65.87	66.54–67.89	39.875	39.625	39.125
Manganese Bronze ..	62.64–63.54	56.65–57.64	67.09	....	30.250	30.000	29.500
Muntz Metal	56.94–57.84	52.75–53.65	....	....	30.125	29.875	29.375
Naval Brass	58.90–59.60	53.21–54.11	65.96–66.86	62.06–62.96	29.875	29.625	29.125
Silicon Bronze	70.48–71.92	69.67–71.11	70.52–71.96	72.66–74.13e	42.250	42.000	41.250
Nickel Silver, 10%...	69.20–70.17	71.53g	71.53	....	35.625	35.375	17.813
Phos. Bronze, A, 5%	85.37–86.79	85.87–87.29	85.87–87.29	87.05–88.47	44.000	43.750	42.750

a. Cents per lb, f.o.b. mill; freight allowed on 500 lb or more. b. Hot-rolled. c. Cold-drawn. d. Free cutting. e. 3% silicon. f. Prices in cents per lb for less than 20,000 lb, f.o.b. shipping point. On lots over 20,000 lb at one time, of any or all kinds of scrap, add 1 cent per lb. Based on copper at 47.5 cents a pound. g. Leaded

19.50-20.50; new brass clippings, 28.00-28.50; light brass, 19.00-19.50; heavy yellow brass, 21.50-22.00; new brass rod ends, 26.50-27.00; auto radiators, unsweated, 24.00-24.50; cocks and faucets, 24.50-25.00; brass pipe, 25.00-25.50.

Lead: Heavy, 12.75-13.00; battery plates, 6.50-6.75; linotype and stereotype, 14.00-14.50; electrotype, 13.25-13.75; mixed babbitt, 15.50.

Magnesium: Clippings, 18.50-19.50; clean castings, 18.00-19.00; iron castings, not over 10% removable Fe, less full deduction for Fe, 16.00-17.00.

Monel: Clippings, 100.00; old sheets, 100.00; turnings, 85.00; rods, 100.00.

Nickel: Sheets and clips, 225.00-230.00; rolled anodes, 225.00-230.00; turnings, 200.00-225.00; rod ends, 225.00-230.00.

Zinc: Old zinc, 6.00-6.50; new die-cast scrap, 6.00; old die-cast scrap, 3.50.

REFINER'S BUYING PRICES

(Cents per pound, carlots, delivered refinery)

Aluminum: 1100 clippings, 22.75-23.00; 3003 clippings, 22.50-23.00; 6151 clippings, 22.00-22.25; 5052 clippings, 22.00-22.25; 2014 clippings, 21.50-22.25; 2017 clippings, 21.50-22.25; 2024 clippings, 21.50-22.25; mixed clippings, 21.50-22.00; old sheet, 20.00; old cast, 20.00; clean old cable (free of steel), 22.25-23.00; borings and turnings, 20.00-21.00.

Beryllium Copper: Heavy scrap, 0.020-in. and heavier, not less than 1.5% Be, 68.00; light scrap, 63.00; turnings and borings, 48.00.

Copper and Brass: No. 1 heavy copper and wire, 43.50; No. 2 heavy copper and wire, 42.00 light copper, 39.75; refinery brass (60% copper) per dry copper content, 40.00.

INGOTMAKERS' BUYING PRICES

(Cents per pound, carlots, delivered)

Copper and Brass: No. 1 heavy copper and wire, 43.50; No. 2 heavy copper and wire, 42.00; light copper, 39.75; No. 1 composition borings, 34.00; No. 1 composition solids, 34.50; heavy yellow brass solids, 24.50; yellow brass turnings, 23.50; radiators, 26.00.

PLATING MATERIAL

(F.o.b. shipping point, freight allowed on quantities)

ANODES

Cadmium: Special or patented shapes, $1.70 per lb.

Copper: Flat-rolled, 65.29; oval, 64.42, 5000-10.,000 lb; electrodeposited, 61.25, 2000-5000 lb lots; cast 60.54, 5000-10,000 lb quantities.

Nickel: Depolarized, less than 100 lb, $1.015; 100-499 lb. 99.50; 500-4999 lb, 95.50; 5000-29,999 lb, 93.50; 30,000 lb, 91.50. Carbonized, deduct 3 cents a lb. All prices eastern delivery, effective Jan. 1, 1955.

Tin: Bar or slab, less than 200 lb, $1.175; 200-499 lb, $1.160; 500-999 lb, $1.155; 1000 lb or more, $1.150.

Zinc: Balls, 21.00; flat tops, 21.00; flats, 22.75; ovals, 22.00, ton lots.

CHEMICALS

Cadmium Oxide: $2.15 per lb, in 100-lb drums.

Chromic Acid: Less than 10,000 lb, 28.50; over 10,000 lb, 27.50.

Copper Cyanide: 100 lb, 85.25; 200 lb, 84.50; 300 lb, 84.25; 400-900 lb, 83.50; 1000 lb, 81.50.

Copper Cyanide: 100 lb 85.25; 200 lb, 84.50; lb, 15.90; 6000 lb or more, 15.65.

Nickel Chloride: 100 lb, 46.50; 200 lb, 44.50; 300 lb, 43.50; 400-4900 lb. 41.50; 5000-9900 lb, 39.50; 10,000 lb and over, 38.50. All prices eastern delivery, effective Jan. 1, 1955.

Nickel Sulphate: 100 lb, 38.25; 200 lb, 36.25; 300 lb, 35.25; 400-4900 lb, 33.25; 5000-35,900 lb, 31.25; 36,000 lb, 30.35. All prices eastern delivery, effective Jan. 1, 1955.

Silver Cyanide: (Cents per ounce) 4-oz bottle, 86.875; 15-oz bottle, 85.625; 80-oz bottle, 83.125; 100-oz bottle, 83.125; f.o.b. St. Louis, New York and Los Angeles. Effective Sept. 30, 1955.

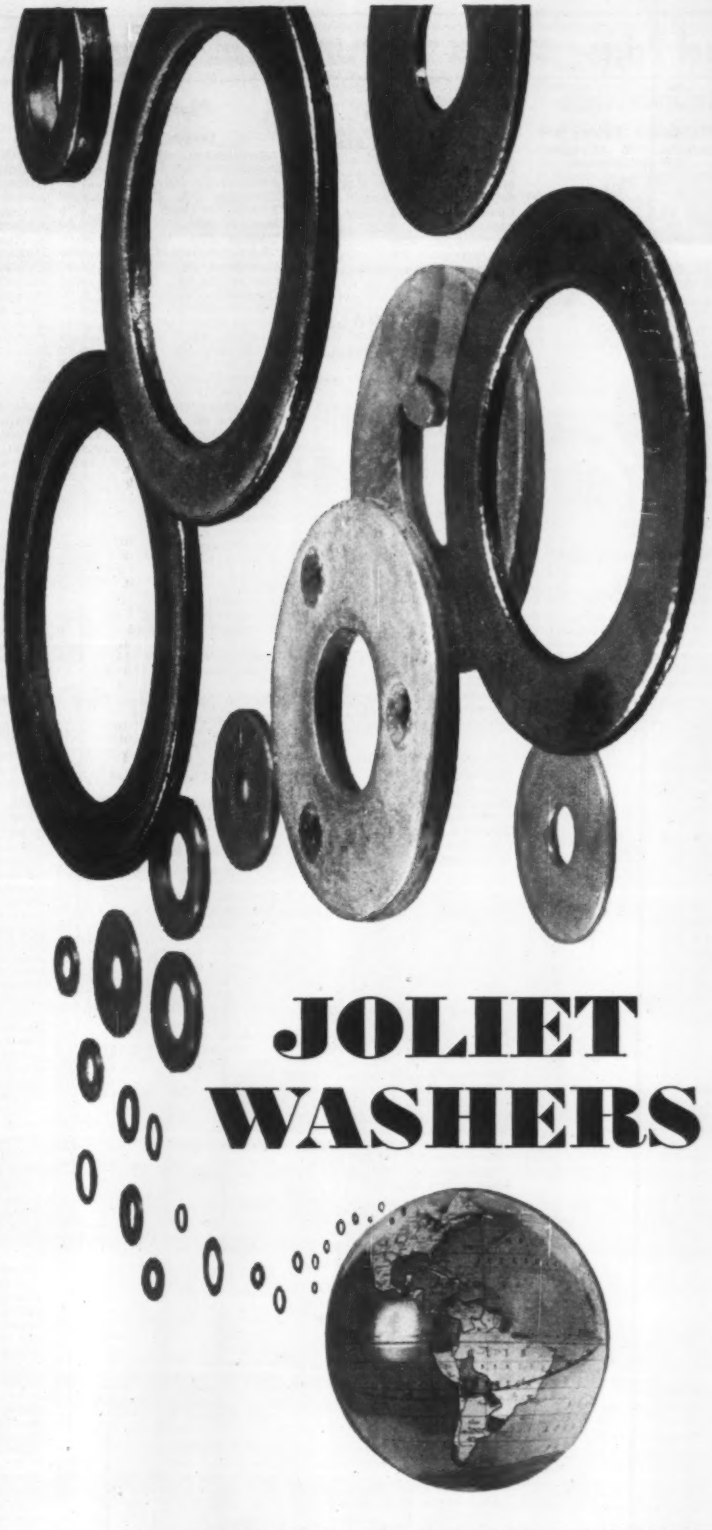
Sodium Cyanide: Egg, under 1000 lb, 19.80; 1000-19,900 lb, 18.80; 20,000 lb, and over, 17.80; granular, add 1-cent premium to above.

Sodium Stannate: Less than 100 lb, 70.90; 100-600 lb, 62.50; 700-1900 lb, 60.00; 2000-9900 lb, 58.30; 10,000 lb or more, 57.10.

Stannous Chloride (anhydrous): Less than 25 lb, $1.677; 25 lb, $1.327; 100 lb, $1.177; 400 lb, $1.153; 5200-19,600 lb, $1.031; 20,000 lb, 90.90.

Stannous Sulphate: Less than 50 lb, $1.304; 50 lb, $1.004; 100-1900 lb, 98.40; 2000 lb or more, 96.40.

Zinc Cyanide: Under 1000 lb, 54.30; 1000 lb and over, 52.30.



WORLD'S FOREMOST PRODUCERS
OF ALL KINDS OF FLAT WASHERS

JOLIET WROUGHT WASHER CO., JOLIET, ILLINOIS

Steel Prices

Mill prices as reported to STEEL, cents per pound except as otherwise noted. *Changes shown in italics.* Code numbers following mill points indicate producing company. Key to producers, page 135; to footnotes, page 137.

SEMIFINISHED

INGOTS, Carbon, Forging (NT)

Munhall,Pa. U5	$65.50

INGOTS, Alloy (NT)

Detroit R7	$69.00
Houston S5	74.00
Midland,Pa. C18	69.00
Munhall,Pa. U5	69.00

BILLETS, BLOOMS & SLABS
Carbon, Rerolling (NT)

Aliquippa,Pa. J5	$68.50
Bessemer,Pa. U5	68.50
Bridgeport,Conn. N19	73.50
Buffalo R2	68.50
Clairton,Pa. U5	68.50
Ensley,Ala. T2	68.50
Fairfield,Ala. T2	68.50
Fontana,Calif. K1	78.00
Gary,Ind. U5	68.50
Johnstown,Pa. B2	68.50
Lackawanna,N.Y. B2	68.50
LoneStar,Tex. L6	74.50
Munhall,Pa. U5	68.50
Pittsburgh J5	68.50
S.Chicago,Ill. R2, U5	68.50
S.Duquesne,Pa. U5	68.50
Youngstown R2	68.50

Carbon, Forging (NT)

Aliquippa,Pa. J5	$84.50
Bessemer,Pa. U5	84.50
Bridgeport,Conn. N19	89.50
Buffalo R2	84.50
Canton,O. R2	86.50
Clairton,Pa. U5	84.50
Conshohocken,Pa. A3	89.50
Ensley,Ala. T2	84.50
Fairfield,Ala. T2	84.50
Fontana,Calif. K1	94.00
Gary,Ind. U5	84.50
Geneva,Utah C11	84.50
Houston S5	101.00
Johnstown,Pa. B2	84.50
Lackawanna,N.Y. B2	84.50
LosAngeles B3	94.00
Midland,Pa. C18	84.50
Munhall,Pa. U5	84.50
Pittsburgh J5	84.50
Seattle B3	98.00
S.Chicago R2,U5,W14	84.50
S.Duquesne,Pa. U5	84.50
S.SanFrancisco B3	94.00

Alloy, Forging (NT)

Bethlehem,Pa. B2	$96.00
Buffalo R2	96.00
Canton,O. R2, T7	96.00
Conshohocken,Pa. A3	103.00
Detroit R7	96.00
Fontana,Calif. K1	117.00
Gary,Ind. U5	96.00
Houston S5	105.00
Ind.Harbor,Ind. Y1	96.00
Johnstown,Pa. B2	96.00
Lackawanna,N.Y. B2	96.00
LosAngeles B3	116.00
Massillon,O. R2	96.00
Midland,Pa. C18	96.00
Munhall,Pa. U5	96.00
S.Chicago R2,U5,W14	96.00
S.Duquesne,Pa. U5	96.00
Struthers,O. Y1	96.00
Warren,O. C17	96.00

ROUNDS, SEAMLESS TUBE (NT)

Buffalo R2	$103.50
Canton,O. R2	103.50
Cleveland R2	103.50
Gary,Ind. U5	103.50
S.Chicago R2, W14	103.50
S.Duquesne,Pa. U5	103.50

SKELP

Aliquippa,Pa. J5	4.325
LoneStar,Tex. L6	4.625
Munhall,Pa. U5	4.225
SparrowsPoint,Md. B2	4.225
Warren,O. R2	4.225
Youngstown R2, U5	4.225

WIRE RODS

AlabamaCity,Ala. R2	5.375
Aliquippa,Pa. J5	5.375
Alton,Ill. L1	5.55
Buffalo W12	5.375
Cleveland A7	5.375
Donora,Pa. A7	5.375
Fairfield,Ala. T2	5.375
Houston S5	5.625
IndianaHarbor,Ind. Y1	5.375
Johnstown,Pa. B2	5.375
Joliet,Ill. A7	5.375
KansasCity,Mo. S5	5.625
Kokomo,Ind. C16	5.475
Los Angeles B3	6.175
Minnequa,Colo. C10	5.625
Monessen,Pa. P7	5.375
N.Tonawanda,N.Y. B11	5.375
Pittsburg,Calif. C11	6.025
Portsmouth,O. P12	5.375
Roebling,N.J. R5	5.475
S.Chicago,Ill. R2	5.375
SparrowsPoint,Md. B2	5.475
Sterling,Ill.(1) N15	5.375
Sterling,Ill. N15	5.475
Struthers,O. Y1	5.375
Worcester,Mass. A7	5.675

STRUCTURALS

Carbon Steel Std. Shapes

Ala.City,Ala. R2	4.60
Aliquippa,Pa. J5	4.60
Bessemer,Ala. T2	4.60
Bethlehem,Pa. B2	4.65
Birmingham C15	5.10
Clairton,Pa. U5	4.60
Fairfield,Ala. T2	4.60
Fontana,Calif. K1	5.30
Gary,Ind. U5	4.60
Geneva,Utah C11	4.60
Houston S5	4.70
Ind.Harbor,Ind. I-2	4.60
Johnstown,Pa. B2	4.65
KansasCity,Mo. S5	4.70
Lackawanna,N.Y. B2	4.65
LosAngeles B3	5.30
Minnequa,Colo. C10	4.90
Munhall,Pa. U5	4.60
Niles,Calif. P1	5.25
Phoenixville,Pa. P4	5.15
Portland,Oreg. O4	5.35
Seattle B3	5.35
S.Chicago U5, W14	4.60
S.SanFrancisco B3	5.25
Torrance,Calif. C11	5.30
Weirton,W.Va. W6	4.60

Wide Flange

Bethlehem,Pa. B2	4.65
Clairton,Pa. U5	4.60
Fontana,Calif. K1	5.45
Lackawanna,N.Y. B2	4.65
Munhall,Pa. U5	4.60
Phoenixville,Pa. P4	5.15
S.Chicago,Ill. U5	4.60

Alloy Std. Shapes

Clairton,Pa. U5	5.65
Fontana,Calif. K1	7.40
Gary,Ind. U5	5.65
Houston S5	5.75
Munhall,Pa. U5	5.65
S.Chicago,Ill. U5	5.65

H.S., L.A. Std. Shapes

Aliquippa,Pa. J5	6.75
Bessemer,Ala. T2	6.75
Bethlehem,Pa. B2	6.80
Clairton,Pa. U5	6.75
Fairfield,Ala. T2	6.75
Fontana,Calif. K1	7.45
Gary,Ind. U5	6.75
Geneva,Utah C11	6.75
Houston S5	6.85
Ind.Harbor,Ind. I-2, Y1	6.75
Johnstown,Pa. B2	6.80
KansasCity,Mo. S5	6.85
Lackawanna,N.Y. B2	6.80
LosAngeles B3	7.45
Munhall,Pa. U5	6.75
Seattle B3	7.50
S.Chicago,Ill U5, W14	6.75
S.SanFrancisco B3	7.40
Struthers,O. Y1	6.75

H.S., L.A. Wide Flange

Bethlehem,Pa. B2	6.80
Lackawanna,N.Y. B2	6.80
Munhall,Pa. U5	6.75
S.Chicago,Ill. U5	6.75

PILING

BEARING PILES

Bethlehem,Pa. B2	4.65
Lackawanna,N.Y. B2	4.65
Munhall,Pa. U5	4.60
S.Chicago,Ill. U5	4.60

STEEL SHEET PILING

Ind.Harbor,Ind. I-2	5.45
Lackawanna,N.Y. B2	5.45
Munhall,Pa. U5	5.45
S.Chicago,Ill. U5	5.45

PLATES

PLATES, Carbon Steel

Ala.City,Ala. R2	4.50
Aliquippa,Pa. J5	4.50
Ashland,Ky.(15) A10	4.50
Bessemer,Ala. T2	4.50
Bridgeport,Conn. N19	4.75
Buffalo R2	4.50
Clairton,Pa. U5	4.50
Claymont,Del. C22	4.80
Cleveland J5, R2	4.60
Coatesville,Pa. L7	4.80
Conshohocken,Pa. A3	4.50
Detroit M1	4.60
Ecorse,Mich. G5	4.60
Fairfield,Ala. T2	4.50
Fontana,Calif.(30) K1	5.20
Gary,Ind. U5	4.50
Geneva,Utah C11	4.50
GraniteCity,Ill. G4	4.70
Harrisburg,Pa. P4	5.10
Houston S5	4.60
Ind.Harbor,Ind. I-2, Y1	4.50
Johnstown,Pa. B2	4.50
Lackawanna,N.Y. B2	4.50
LoneStar,Tex. L6	4.85
Mansfield,O. E6	4.50
Minnequa,Colo. C10	5.35
Munhall,Pa. U5	4.50
Newport,Ky. N9	4.50
Pittsburgh J5	4.50
Riverdale,Ill. A1	4.725
Seattle B3	5.40
Sharon,Pa. S3	4.50
S.Chicago R2, U5, W14	4.50
SparrowsPoint,Md. B2	4.50
Steubenville,O. W10	4.50
Warren,O. R2	4.50
Weirton,W.Va. W6	4.50
Youngstown R2, U5, Y1	4.50

PLATES, Carbon Abras. Resist.

Claymont,Del. C22	5.65
Fontana,Calif. K1	6.35
Geneva,Utah C11	5.65
Johnstown,Pa. B2	5.65
SparrowsPoint,Md. B2	5.65

PLATES, Wrought Iron

Economy,Pa. B14	10.40

PLATES, High Strength Low-Alloy

Aliquippa,Pa. J5	6.725
Bessemer,Ala T2	6.725
Clairton,Pa. U5	6.725
Cleveland J5, R2	6.725
Claymont,Del. C22	6.725
Coatesville,Pa. L7	7.025
Conshohocken,Pa. A3	6.725
Ecorse,Mich. G5	6.825
Fairfield,Ala. T2	6.725
Fontana,Calif.(30) K1	7.425
Gary,Ind. U5	6.725
Geneva,Utah C11	6.725
Houston S5	6.825
Ind.Harbor,Ind. I-2, Y1	6.725
Johnstown,Pa. B2	6.725
Munhall,Pa. U5	6.725
Pittsburgh J5	6.725
Seattle B3	7.625
Sharon,Pa. S3	6.725
S.Chicago,Ill. U5, W14	6.725
SparrowsPoint,Md. B2	6.725
Warren,O. R2	6.725
Youngstown U5, Y1	6.725

PLATES, Alloy

Bridgeport,Conn. N19	6.55
Claymont,Del. C22	6.30
Coatesville,Pa. L7	6.30
Fontana,Calif. K1	7.00
Gary,Ind. U5	6.30
Houston S5	6.40
Ind.Harbor,Ind. Y1	6.30
Johnstown,Pa. B2	6.30
Munhall,Pa. U5	6.30
Newport,Ky. N9	6.30
Seattle B3	7.20
Sharon,Pa. S3	6.30
S.Chicago,Ill. U5, W14	6.30
SparrowsPoint,Md. B2	6.30
Youngstown Y1	6.30

FLOOR PLATES

Cleveland J5	5.575
Conshohocken,Pa. A3	5.575
Harrisburg,Pa. P4	5.575
Ind.Harbor,Ind. I-2	5.575
Munhall,Pa. U5	5.575
S.Chicago,Ill. U5	5.575

PLATES, Ingot Iron

Ashland c.l. (15) A10	4.75
Ashland l.c.l. (15) A10	5.25
Cleveland c.l. R2	5.10
Warren,O. c.l. R2	5.10

BARS

(Commercial Quality)

BARS, Hot-Rolled Carbon

Ala.City,Ala.(9) R2	4.65
Aliquippa,Pa.(9) J5	4.65
Alton,Ill. L1	4.85
Atlanta A11	4.85
Bessemer,Ala.(9) T2	4.65
Birmingham C15	5.15
Bridgeport,Conn. N19	4.80
Buffalo(9) R2	4.65
Canton,O.(9) R2	4.75
Clairton,Pa.(9) U5	4.65
Cleveland(9) R2	4.65
Ecorse,Mich.(9) G5	4.75
Emeryville,Calif. J7	5.40
Fairfield,Ala.(9) T2	4.65
Fairless,Pa.(9) U5	4.80
Fontana,Calif. K1	5.35
Gary,Ind.(9) U5	4.65
Houston(9) S5	4.90
Ind.Harbor,Ind.(9) I-2	4.65
Ind.Harbor,Ind. Y1	4.65
Johnstown,Pa.(9) B2	4.65
Joliet,Ill. P22	5.15
KansasCity,Mo.(9) S5	4.90
Lackawanna(9) B2	4.65
LosAngeles(9) B3	5.35
Massillon,O.(9) R2	4.75
Midland,Pa.(9) C18	4.65
Milton,Pa. M18	4.80
Minnequa,Colo. C10	5.10
Niles,Calif. P1	5.35
N.T'wanda,N.Y.(9) B11	4.65
Pittsburg,Calif.(9) C11	5.35
Pittsburgh(9) J5	4.65
Portland,Oreg. O4	5.40
Seattle B3, N14	5.40
S.Chicago W14	4.65
S.Chicago,Ill.(9) R2, U5	4.65
S.Duquesne,Pa.(9) U5	4.65
S.SanFran.,Calif.(9) B3	5.40
Sterling,Ill.(1) N15	4.65
Sterling,Ill. N15	4.75
Struthers,O. Y1	4.65
Torrance,Calif(9) C11	5.35
Warren,O.(9) R2	4.65
Weirton,W.Va.(9) W6	4.65
Youngston(9) R2, U5	4.65

BARS, H.R. Leaded Alloy

Warren,O. C17	6.575

BARS, Hot-Rolled Alloy

Bethlehem,Pa. B2	5.575
Bridgeport,Conn. N19	5.725
Buffalo R2	5.575
Canton,O. R2, T7	5.575
Clairton,Pa. U5	5.575
Detroit R7	5.575
Ecorse,Mich. G5	5.675
Fairless,Pa. U5	5.725
Fontana,Calif. K1	6.625
Gary,Ind. U5	5.575
Houston S5	5.825
Ind.Harbor,Ind. I-2, Y1	5.575
Johnstown,Pa. B2	5.575
KansasCity,Mo. S5	5.825
Lackawanna,N.Y. B2	5.575
LosAngeles B3	6.625
Massillon,O. R2	5.575
Midland,Pa. C18	5.575
S.Chicago R2, U5, W14	5.575
S.Duquesne,Pa. U5	5.575
Struthers,O. Y1	5.575
Warren,O. C17	5.575
Youngstown U5	5.575

BARS & SMALL SHAPES, H.R.
High-Strength Low-Alloy

Aliquippa,Pa. J5	6.80
Bessemer,Ala. T2	6.80
Bethlehem,Pa. B2	6.80
Clairton,Pa. U5	6.80
Cleveland R2	6.80
Ecorse,Mich. G5	6.90
Fairfield,Ala. T2	6.80
Fontana,Calif. K1	7.50
Gary,Ind. U5	6.80
Houston S5	7.05
Ind.Harb.,Ind. I-2, Y1	6.80
Johnstown,Pa. B2	6.80
KansasCity,Mo. S5	7.05
Lackawanna,N.Y. B2	6.80
LosAngeles B3	7.50
Pittsburgh J5	6.80
Seattle B3	7.55
S.Chicago W14	6.80
S.Duquesne,Pa. U5	6.80
S.SanFrancisco B3	7.55
Struthers,O. Y1	6.80
Warren,O. R2	6.80
Youngstown U5	6.80

BAR SIZE ANGLES; H.R. Carbon

Bethlehem,Pa.(9) B2	4.80
Lackawanna(9) B2	4.65

BAR SIZE ANGLES; S. Shapes

Aliquippa,Pa. J5	4.65
Atlanta A11	4.85
Fontana,Calif. K1	5.35
Joliet,Ill. P22	5.10
Niles,Calif. P1	5.35
Pittsburgh J5	4.65
Portland,Oreg. O4	5.40
SanFrancisco S7	5.05

BAR SHAPES, Hot-Rolled Alloy

Clairton,Pa. U5	5.65
Gary,Ind. U5	5.65
Houston S5	5.90
KansasCity,Mo. S5	5.90
Youngstown U5	5.65

BARS, C.F. Leaded Alloy

Ambridge,Pa. W18	8.325
Camden,N.J. P13	8.35
Chicago W18	8.325
Cleveland C20	8.325
Monaca,Pa. S17	8.325
Newark,N.J. W18	8.50
SpringCity,Pa. K3	8.30
Warren,O. C17	8.575

BARS, Cold-Finished Carbon

Ambridge,Pa. W18	6.25
BeaverFalls,Pa. M12,R2	6.25
Buffalo B5	6.30
Camden,N.J. P13	6.70
Carnegie,Pa. C12	6.25
Chicago W18	6.25
Cleveland A7, C20	6.25
Detroit B5, P17	6.45
Detroit R7	6.25
Donora,Pa. A7	6.25
Elyria,O. W8	6.25
FranklinPark,Ill. N5	6.25
Gary,Ind. R2	6.25
GreenBay,Wis. F7	6.25
Hammond,Ind. L2, M13	6.25
Hartford,Conn. R2	6.75
Harvey,Ill. B5	6.25
LosAngeles(49) S30	7.70
LosAngeles R2	7.70
Mansfield,Mass. B5	6.80
Massillon,O. R2, R8	6.25
Midland,Pa. C18	6.25
Monaca,Pa. S17	6.25
Newark,N.J. W18	6.70
NewCastle,Pa.(17) B4	6.25
Pittsburgh J5	6.25
Plymouth,Mich. P5	6.50
Putnam,Conn. W18	6.80
Readville,Mass. C14	6.80
S.Chicago,Ill. W14	6.25
SpringCity,Pa. W3	6.70
Struthers,O. Y1	6.25
Waukegan,Ill. A7	6.25
Worcester,Mass. W19	6.70
Youngstown F3, Y1	6.25

BARS, Cold-Finished Carbon
(Turned and Ground)

Cumberland,Md.(5) C19	5.16

BARS, Cold-Finished Alloy

Ambridge,Pa. W18	7.425
BeaverFalls,Pa.M12,R2	7.425
Bethlehem,Pa. B2	7.425
Buffalo B5	7.425
Camden,N.J. P13	7.60
Canton,O. T7	7.425
Carnegie,Pa. C12	7.425
Chicago W18	7.425
Cleveland A7, C20	7.425
Detroit R7	7.425
Detroit B5, P17	7.625
Donora,Pa. A7	7.425
Elyria,O. W8	7.425
Gary,Ind. R2	7.425
GreenBay,Wis. F7	7.425
Hammond,Ind. L2, M13	7.425
Hartford,Conn. R2	7.725
Harvey,Ill. B5	7.425
Lackawanna,N.Y. B2	7.425
LosAngeles S30	9.10
Mansfield,Mass. B5	7.725
Massillon,O. R2, R8	7.425
Midland,Pa. C18	7.425
Monaca,Pa. S17	7.425
Newark,N.J. W18	7.60
Plymouth,Mich. P5	7.625
S.Chicago W14	7.425
SpringCity,Pa. K3	7.60
Struthers,O. Y1	7.425
Warren,O. C17	7.425
Waukegan,Ill. A7	7.425
Worcester,Mass. A7	7.725
Youngstown F3, Y1	7.425

BARS, Reinforcing
(To Fabricators)

Ala.City,Ala. R2	4.65
Atlanta A11	4.85
Birmingham C15	5.15
Buffalo R2	4.65
Cleveland R2	4.65
Ecorse,Mich. G5	4.75
Emeryville,Calif. J7	5.40
Fairfield,Ala. T2	4.65
Fairless,Pa. U5	4.80
Fontana,Calif. K1	5.35
Ft.Worth,Tex.(42) T4	5.10
Gary,Ind. U5	4.65
Houston S5	4.90

Ind.Harbor,Ind. I-2, Y1	4.65
Johnstown,Pa. B2	4.65
Joliet,Ill. P22	5.15
KansasCity,Mo. S5	4.90
Lackawanna,N.Y. B2	4.65
LosAngeles B3	5.35
Milton,Pa. M18	4.80
Minnequa,Colo. C10	5.10
Niles,Calif. P1	5.35
Pittsburg,Calif. C11	5.35
Pittsburgh J5	4.65
Portland,Oreg. O4	5.40
SandSprings,Okla. S5	5.15
Seattle B3, N14	5.40
S.Chicago R2	4.65
S.Duquesne,Pa. U5	4.65
S.SanFrancisco B3	5.40
SparrowsPoint,Md. B2	4.65
Sterling,Ill.(1) N15	4.65
Sterling,Ill. N15	4.75
Struthers,O. Y1	4.65
Torrance,Calif. C11	5.35
Youngstown R2, U5	4.65

BARS, Reinforcing
(Fabricated; to Consumers)

Johnstown,Pa. ¼-1" B2	6.15
KansasCity,Kans. S5	6.45
Lackawanna,N.Y. B2	6.17
Marion,O. P11	6.15
Pittsburgh U8	6.17
Seattle B3, N14	6.60
SparrowsPt. ½-1" B2	6.15
Williamsport,Pa. S19	6.00

RAIL STEEL BARS

ChicagoHts.(3) C2, I-2	4.65
ChicagoHts.(4) C2, I-2	4.65
Ft.Worth,Tex.(26) T4	5.10
Franklin,Pa(3) F5	4.65
Franklin,Pa.(4) F5	4.65
JerseyShore,Pa.(4) J8	4.65
Marion,O.(3) P11	4.65
Moline,Ill.(3) R2	4.80
Tonawanda(3) B12	4.65
Tonawanda(4) B12	5.15
Williamsport,Pa.(3) S19	4.65

BARS, Wrought Iron

Economy,Pa.(S.R.)B14	11.50
Economy,Pa.(D.R.)B14	14.30
Economy(Staybolt)B14	14.65
McK.Rks. (S.R.) L5	11.50
McK.Rks.(D.R.) L5	16.00
McK.Rks.(Staybolt) L5	17.00

SHEETS

SHEETS, Hot-Rolled Steel
(18 Gage and Heavier)

Ala.City,Ala. R2	4.325
Allenport,Pa. P7	4.325
Ashland,Ky.(8) A10	4.325
Cleveland J5, R2	4.325
Conshohocken,Pa. A3	4.375
Detroit(8) M1	4.425
Dravosburg,Pa. U5	4.325
Ecorse,Mich. G5	4.425
Fairfield,Ala. T2	4.325
Fairless,Pa. U5	4.375
Fontana,Calif. K1	5.125
Gary,Ind. U5	4.325
Geneva,Utah C11	4.425
GraniteCity,Ill. G4	4.525
Ind.Harbor,Ind. I-2,Y1	4.325
Lackawanna,N.Y. B2	4.325
Mansfield,O. E6 (37)	4.325
Munhall,Pa. U5	4.325
Newport,Ky.(8) N9	4.325
Niles,O. M21	4.325
Pittsburg,Calif. C11	5.025
Pittsburgh J5	4.325
Portsmouth,O. P12	4.325
Riverdale,Ill. A1	4.55
Sharon,Pa. S3	4.325
S.Chicago,Ill. W14	4.325
SparrowsPoint,Md. B2	4.325
Steubenville,O. W10	4.325
Warren,O. R2	4.325
Weirton,W.Va. W6	4.325
Youngstown U5, Y1	4.325

SHEETS, H.R. (19 Ga. & Lighter)

Ala.City,Ala. R2	5.625
Niles,O. M21	5.325

SHEETS, H.R. Alloy

Ind.Harbor,Ind. Y1	7.20
Youngstown Y1	7.20

SHEETS, H.R. (14 Ga. & Heavier)
High-Strength Low-Alloy

Cleveland J5, R2	6.375
Conshohocken,Pa. A3	6.425
Dravosburg,Pa. U5	6.375
Ecorse,Mich. G5	6.475
Fairfield,Ala. T2	6.375
Fairless,Pa. U5	6.425
Fontana,Calif. K1	7.175
Gary,Ind. U5	6.375
Ind.Harbor,Ind. I-2, Y1	6.375
Lackawanna(35) B2	6.375
Munhall,Pa. U5	6.375
Pittsburgh J5	6.375
Sharon,Pa. S3	6.375
S.Chicago,Ill. U5	6.375
SparrowsPoint(36) B2	6.375
Warren,O. R2	6.375
Youngstown U5, Y1	6.375

SHEETS, Hot-Rolled Ingot Iron
(18 Gage and Heavier)

Ashland,Ky.(8) A10	4.575
Ind.Harbor,Ind. I-2	4.575

SHEETS, Cold-Rolled Steel
(Commercial Quality)

Allenport,Pa. P7	5.325
Cleveland J5, R2	5.325
Conshohocken,Pa. A3	5.375
Dravosburg,Pa. U5	5.325
Detroit M1	5.325
Ecorse,Mich. G5	5.425
Fairfield,Ala. T2	5.325
Fairless,Pa. U5	5.375
Follansbee,W.Va. F4	5.325
Fontana,Calif. K1	6.525
Gary,Ind. U5	5.325
GraniteCity,Ill. G4	5.525
Ind.Harbor,Ind. I-2, Y1	5.325
Lackawanna, N.Y. B2	5.325
Mansfield,O. E6	5.325
Middletown,O. A10	5.325
Newport,Ky. N9	5.325
Pittsburg,Calif. C11	6.275
Pittsburgh J5	5.325
Portsmouth,O. P12	5.325
SparrowsPoint,Md. B2	5.325
Steubenville,O. W10	5.325
Warren,O. R2	5.325
Weirton,W.Va. W6	5.325
Youngstown Y1	5.325

SHEETS, Cold-Rolled
High-Strength Low-Alloy

Cleveland J5, R2	7.875
Dravosburg,Pa. U5	7.875
Ecorse,Mich. G5	7.975
Fairless,Pa. U5	7.925
Fontana,Calif. K1	9.075
Gary,Ind. U5	7.875
IndianaHarbor,Ind. Y1	7.875
Lackawanna(37) B2	7.875
Pittsburgh J5	7.875
SparrowsPoint(38) B2	7.875
Warren,O. R2	7.875
Weirton,W.Va. W6	7.875
Youngstown Y1	7.875

SHEETS, Cold-Rolled Ingot Iron

Middletown,O. A10	5.825

SHEETS, Culvert (16 Gage)	Cu Alloy	Cu Fe
Ashland,Ky. A10	6.90	...
Canton,O. R2	6.10	6.55
Dravosburg U5	6.10	...
Fairfield T2	6.10	...
Gary,Ind. U5	6.10	6.35
Ind.Harbor I-2	6.10	6.35
Kokomo,Ind. C16	6.20	...
MartinsFry. W10	6.10	...
Newport,Ky. N9	6.10	6.35
Pitts.,Calif. C11	6.85	...
SparrowsPt. B2	6.10	...

SHEETS, Culvert—Pure Iron

Ashland,Ky. A10	7.15
Gary,Ind. U5	6.35
MartinsFry,O. W10	6.35

SHEETS, Galvanized Steel
Hot-Dipped

Ala.City,Ala. R2	5.85‡
Ashland,Ky. A10	5.85†
Canton,O. R2	5.85‡
Dover,O. R1	5.85†
Dravosburg,Pa. U5	5.85†
Fairfield,Ala. T2	5.85†
Gary,Ind. U5	5.85*
GraniteCity,Ill. G4	6.05
Ind.Harbor,Ind. I-2	5.85†
Kokomo,Ind. C16	5.95‡
MartinsFerry,O. W10	5.85*
Middletown,O. A10	5.85†
Newport,Ky. N9	5.85‡
Pittsburg,Calif. C11	6.60*
Pittsburgh J5	5.85†
SparrowsPt.,Md. B2	5.85†
Warren,O. R2	5.85†
Weirton,W. Va. W6	5.85*

*Continuous and noncontinuous. †Continuous. ‡Noncontinuous.

SHEETS, Well Casing

Fontana,Calif. K1	6.625

SHEETS, Galvanized
High-Strength Low-Alloy

Dravosburg,Pa. U5	8.60
SparrowsPoint(39) B2	8.60

SHEETS, Galvannealed Steel

Canton,O. R2	6.25
Dravosburg,Pa. U5	6.25
Kokomo,Ind. C16	6.60
Newport,Ky. N9	6.25

SHEETS, Galvanized Ingot Iron
(Hot-dipped Continuous)

Ashland,Ky. A10	6.10
Middletown,O. A10	6.10

SHEETS, Electrogalvanized

Cleveland(28) R2	6.70
Niles, O.(28) R2	6.70
Weirton,W.Va. W6	6.55

SHEETS, Aluminum Coated

Butler,Pa. A10 (type 1)	8.50
Butler,Pa. A10 (type 2)	8.60

SHEETS, Enameling Iron

Ashland,Ky. A10	5.90
Cleveland R2	5.90
Dravosburg,Pa. U5	5.90
Gary,Ind. U5	5.90
GraniteCity,Ill. G4	6.10
Ind.Harbor,Ind. I-2	5.90
Middletown,O. A10	5.90
Niles,O. M21	5.90
Youngstown Y1	5.90

BLUED STOCK, 29 Gage

Follansbee,W.Va. F4	7.75
Ind.Habor,Ind. I-2	7.75
Yorkville,O. W10	7.75

SHEETS, Long Terne Steel
(Commercial Quality)

BeechBottom,W.Va. W10	6.25
Gary,Ind. U5	6.25
Mansfield,O. E6	6.25
Middletown,O. A10	6.25
Niles,O. M21	6.25
Weirton,W.Va. W6	6.25

SHEETS, Long Terne, Ingot Iron

Middletown,O. A10	6.65

Key To Producers

A1	Acme Steel Co.
A3	Alan Wood Steel Co.
A4	Allegheny Ludlum Steel
A5	Alloy Metal Wire Div., H. K. Porter Co. Inc.
A6	American Shim Steel Co.
A7	American Steel & Wire Div., U. S. Steel Corp.
A8	Anchor Drawn Steel Co.
A9	Angell Nail & Chaplet
A10	Armco Steel Corp.
A11	Atlantic Steel Co.
B1	Babcock & Wilcox Co.
B2	Bethlehem Steel Co.
B3	Beth. Pac. Coast Steel
B4	Blair Strip Steel Co.
B5	Bliss & Laughlin Inc.
B8	Braeburn Alloy Steel
B9	Brainard Steel Div., Sharon Steel Corp.
B10	E. & G. Brooke, Wickwire Spencer Steel Div. Colo. Fuel & Iron
B11	Buffalo Bolt Co., Div., Buffalo-Eclipse Corp.
B12	Buffalo Steel Corp.
B14	A. M. Byers Co.
B15	J. Bishop & Co.
C1	Calstrip Steel Corp.
C2	Calumet Steel Div. Borg-Warner Corp.
C4	Carpenter Steel Co.
C7	Cleve.Cold Rolling Mills
C8	Cold Metal Products Co.
C9	Colonial Steel Co.
C10	Colorado Fuel & Iron
C11	Columbia-Geneva Steel
C12	Columbia Steel & Shaft.
C13	Columbia Tool Steel Co.
C14	Compressed Steel Shaft.
C15	Connors Steel Div. H. K. Porter Co. Inc.
C16	Continental Steel Corp.
C17	Copperweld Steel Co.
C18	Crucible Steel Co.
C19	Cumberland Steel Co.
C20	Cuyahoga Steel & Wire
C22	Claymont Steel Products Dept. Wickwire Spencer Steel Division
C23	Charter Wire Inc.
C24	G. O. Carlson Inc.
D2	Detroit Steel Corp.
D3	Detroit Tube & Steel Div., Sharon Steel Corp.
D4	Disston & Sons, Henry
D6	Driver-Harris Co.
D7	Dickson Weatherproof Nail Co.
D8	Damascus Tube Co.
D9	Wilbur B. Driver Co.
E1	Eastern Gas&Fuel Assoc.
E2	Eastern Stainless Steel
E4	Electro Metallurgical Co.
E5	Elliott Bros. Steel Co.
E6	Empire Steel Corp.
F2	Firth Sterling Inc.
F3	Fitzsimmons Steel Co.
F4	Follansbee Steel Corp.
F5	Franklin Steel Div. Borg-Warner Corp.
F6	Fretz-Moon Tube Co.
F7	Ft.HowardSteel&Wire
F8	Ft. Wayne Metals Inc.
G2	Globe Iron Co.
G4	Granite City Steel Co.
G5	Great Lakes Steel Corp.
G6	Greer Steel Co.
H1	Hanna Furnace Corp.
H7	Helical Tube Co.
I-1	Igoe Bros. Inc.
I-2	Inland Steel Co.
I-3	Interlake Iron Corp.
I-4	Ingersoll Steel Div., Borg-Warner Corp.
I-6	Ivins, E., Steel Tube
I-7	Indiana Steel&Wire Co.
J1	Jackson Iron & Steel Co.
J3	Jessop Steel Co.
J4	Johnson Steel&Wire Co.
J5	Jones & Laughlin Steel
J6	Joslyn Mfg. & Supply
J7	Judson Steel Corp.
J8	Jersey Shore Steel Co.
K1	Kaiser Steel Corp.
K2	Keokuk Electro-Metals
K3	Keystone Drawn Steel
K4	Keystone Steel & Wire
K7	Kenmore Metals Corp.
L1	Laclede Steel Co.
L2	LaSalle Steel Co.
L3	Latrobe Steel Co.
L5	Lockhart Iron & Steel
L6	Lone Star Steel Co.
L7	Lukens Steel Co.
M1	McLouth Steel Corp.
M4	Mahoning Valley Steel
M6	Mercer Pipe Div., Sawhill Tubular Products
M8	Mid-States Steel & Wire
M12	Moltrup Steel Products
M13	Monarch Steel Div., Jones & Laughlin Steel Corp.
M14	McInnes Steel Co.
M16	Md.Fine&Special Wire
M17	Metal Forming Corp.
M18	Milton Steel Prod. Div., Merritt-Chapman&Scott
M21	Mallory-Sharon Titanium Corp.
N1	National-Standard Co.
N2	National Supply Co.
N3	National Tube Div., U.S. Steel Corp.
N5	Nelsen Steel & Wire Co.
N6	New Eng. High Carb. Wire
N8	Newman-Crosby Steel
N9	Newport Steel Corp.
N14	Northwest.SteelRoll.Mills
N15	Northwestern S.&W. Co.
N16	New Delphos Mfg. Co.
N19	Northeastern Steel Corp.
O3	Oliver Iron & Steel Corp.
O4	Oregon Steel Mills
P1	PacificStatesSteelCorp.
P2	Pacific Tube Co.
P4	Phoenix Iron & Steel Co. Sub. of Barium Steel Corp.
P5	Pilgrim Drawn Steel
P6	Pittsburgh Coke&Chem.
P7	Pittsburgh Steel Co.
P11	Pollak Steel Co.
P12	Portsmouth Division, Detroit Steel Corp.
P13	Precision Drawn Steel
P14	Pitts. Screw & Bolt Co.
P15	Pittsburgh Metallurgical
P16	Page Steel & Wire Div., Amer. Chain & Cable
P17	Plymouth Steel Co.
P19	Pitts. Rolling Mills
P20	Prod. Steel Strip Corp.
P22	Phoenix Mfg. Co.
R1	Reeves Steel & Mfg. Co.
R2	Republic Steel Corp.
R3	Rhode Island Steel Corp.
R5	Roebling's Sons, John A.
R6	Rome Strip Steel Co.
R7	Rotary Electric Steel Co.
R8	RelianceDiv.,EatonMfg.
R9	Rome Mfg. Co.
R10	Rodney Metals Inc.
S1	Senaca Wire & Mfg. Co.
S3	Sharon Steel Corp.
S4	Sharon Tube Co.
S5	Sheffield Steel Div., Armco Steel Corp.
S6	Shenango Furnace Co.
S7	Simmons Co.
S8	Simonds Saw & Steel Co.
S12	Spencer Wire Corp.
S13	Standard Forgings Corp.
S14	Standard Tube Co.
S15	Stanley Works
S17	Superior Drawn Steel Co.
S18	Superior Steel Corp.
S19	Sweet's Steel Co.
S20	Southern States Steel
S23	Superior Tube Co.
S25	Stainless Welded Prod.
S26	Specialty Wire Co. Inc.
S30	Sierra Drawn Steel Corp.
S40	Seneca Steel Service
T2	Tenn. Coal & Iron Div., U. S. Steel Corp.
T3	Tenn. Prod. & Chem.
T4	Texas Steel Co.
T5	Thomas Strip Division, Pittsburgh Steel Co.
T6	Thompson Wire Co.
T7	Timken Roller Bearing
T9	Tonawanda Iron Div. Am. Rad. & Stan. San.
T13	Tube Methods Inc.
U4	Universal-Cyclops Steel
U5	United States Steel Corp.
U6	U. S. Pipe & Foundry
U7	Ulbrich Stainless steels
U8	U. S. Steel Supply Div. U. S. Steel Corp.
V2	Vanadium-Alloys Steel
V3	Vulcan Crucible Division, H. K. Porter, Inc.
W1	Wallace Barnes Co.
W2	Wallingford Steel Co.
W3	Washburn Wire Co.
W4	Washington Steel Corp.
W6	Weirton Steel Co.
W7	W. Va. Steel&Mfg. Co.
W8	Western Automatic Machine Screw Co.
W9	Wheatland Tube Co.
W10	Wheeling Steel Corp.
W12	Wickwire Spencer Steel Div., Colo. Fuel & Iron
W13	Wilson Steel & Wire Co.
W14	Wisconsin Steel Div., International Harvester
W15	Woodward Iron Co.
W18	Wyckoff Steel Co.
W19	Worcester Pressed Steel
Y1	Youngstown Sheet&Tube

STRIP

STRIP, Hot-Rolled Carbon

Ala.City,Ala.(27) R2	4.325
Allenport,Pa. P7	4.325
Alton,Ill. L1	4.50
Ashland,Ky.(8) A10	4.325
Atlanta A11	4.525
Bessemer,Ala. T2	4.325
Birmingham C15	4.825
Bridgeport,Conn. N19	4.625
Buffalo(27) R2	4.325
Conshohocken,Pa. A3	4.375
Detroit M1	4.425
Ecorse,Mich. G5	4.425
Fairfield,Ala. T2	4.325
Fontana,Calif. K1	5.125
Gary,Ind. U5	4.325
Ind.Harbor,Ind. I-2,Y1	4.325
Johnstown,Pa.(25) B2	4.325
Lackaw'na,N.Y.(24) B2	4.325
LosAngeles(25) B3	5.075
Milton,Pa. M18	4.325
Minnequa,Colo. C10	5.425
Pittsburg,Calif. C11	5.075
Riverdale,Ill. A1	4.55
SanFrancisco S7	5.05
Seattle(25) B3	5.325
Seattle N14	5.40
Sharon,Pa. S3	4.325
S.Chicago,Ill. W14	4.325
S.SanFrancisco(25) B3	5.075
SparrowsPoint,Md. B2	4.325
Sterling(1) N15	4.325
Sterling,Ill. N15	4.425
Torrance,Calif. C11	5.075
Warren,O. R2	4.325
Weirton,W.Va. W6	4.325
Youngstown U5	4.325

STRIP, Hot-Rolled Alloy

Bridgeport,Conn. N19	7.50
Carnegie,Pa. S18	7.20
Fontana,Calif. K1	8.95
Gary,Ind. U5	7.20
Ind.Harbor,Ind. Y1	7.20
LosAngeles B3	8.40
Newport,Ky. N9	7.20
Sharon,Pa. S3	7.20
S.Chicago W14	7.20
Youngstown U5, Y1	7.20

STRIP, Hot-Rolled High-Strength Low-Alloy

Bessemer,Ala. T2	6.425
Conshohocken,Pa. A3	6.425
Ecorse,Mich. G5	6.525
Fairfield,Ala. T2	6.425
Fontana,Calif. K1	7.575
Gary,Ind. U5	6.425
Houston S5	6.675
Ind.Harbor,Ind. I-2,Y1	6.425
KansasCity,Mo. S5	6.675
Lackawanna,N.Y. B2	6.425
LosAngeles(25) B3	7.175
Seattle(25) B3	7.425
Sharon,Pa. S3	6.425
S.SanFrancisco(25) B3	7.175
SparrowsPoint,Md. B2	6.425
Warren,O. R2	6.425
Weirton,W.Va. W6	6.425
Youngstown U5, Y1	6.425

STRIP, Hot-Rolled Ingot Iron

Ashland,Ky.(8) A10	4.575

STRIP, Cold-Rolled Carbon

Anderson,Ind. G6	6.25
Baltimore T6	6.25
Boston T6	6.80
Buffalo S40	6.25
Cleveland A7, J5	6.25
Conshohocken,Pa. A3	6.30
Dearborn,Mich. D3	6.35
Detroit D2, M1, P20	6.35
Dover,O. G6	6.25
Ecorse,Mich. G5	6.35
Follansbee,W.Va. F4	6.25
Fontana,Calif. K1	8.00
FranklinPark,Ill. T6	6.35
Ind.Harbor,Ind. I-2	6.35
Ind.Harbor,Ind. Y1	6.25
Indianapolis C8	6.40
Lackawanna,N.Y. B2	6.25
LosAngeles C1	8.30
NewBedford,Mass. R10	6.70
NewBritain(10) S15	6.25
NewCastle,Pa. B4, E5	6.25
NewHaven,Conn. A7, D2	6.70
NewKensington,Pa. A6	6.25
Pawtucket,R.I. R3	6.90
Pawtucket,R.I. N8	6.80
Pittsburgh J5	6.25
Riverdale,Ill. A1	6.35
Rome,N.Y.(32) R6	6.25
Sharon,Pa. S3	6.25
SparrowsPt.,Md. B2	6.25
Trenton,N.J.(31) R5	7.80
Wallingford,Conn. W2	6.70
Warren,O. R2, T5	6.25
Weirton,W.Va. W6	6.25
Worcester,Mass. A7	6.80
Youngstown C8, Y1	6.25

STRIP, Cold-Rolled Alloy

Boston T6	13.80
Carnegie,Pa. S18	13.45
Cleveland A7	13.45
Dover,O. G6	13.45
FranklinPark,Ill. T6	13.45
Harrison,N.J. C18	13.45
Indianapolis C8	13.60
Pawtucket,R.I. N8	13.80
Sharon,Pa. S3	13.45
Worcester,Mass. A7	13.75
Youngstown C8	13.45

STRIP, Cold-Rolled High-Strength Low-Alloy

Cleveland A7	9.10
Dearborn,Mich. D3	9.20
Dover,O. G6	9.30
Ecorse,Mich. G5	9.20
Ind.Harbor,Ind. Y1	9.30
Lackawanna,N.Y. B2	9.10
Sharon,Pa. S3	9.10
SparrowsPoint,Md. B2	9.10
Warren,O. R2	9.10
Weirton,W.Va. W6	9.10
Youngstown Y1	9.30

STRIP, Cold-Finished Spring Steel (Annealed)

STRIP, Cold-Finished Spring Steel (Annealed)	0.26-0.40C	0.41-0.60C	0.61-0.80C	0.81-1.05C	1.06-1.35C
Baltimore T6	7.40	9.35	10.90	13.05	15.75
Boston T6	7.65	9.35	10.90	13.05	15.75
Bristol,Conn. W1	...	...	10.90	13.05	15.75
Carnegie,Pa. S18	...	9.05	10.60	12.75	....
Cleveland A7	7.10	9.05	10.60	12.75	15.45
Cleveland C7	...	9.05	10.60	12.75	15.45
Dearborn,Mich. D3	7.20	9.15	10.70	....	....
Detroit D2	7.20	9.15	10.70	12.85	....
Dover,O. G6	7.10	9.05	10.60	12.75	15.45
FranklinPark,Ill. T6	7.20	9.05	10.60	12.75	15.45
Harrison,N.J. C18	...	...	10.90	13.05	15.75
Indianapolis C8	7.25	9.20	10.60	12.75	15.45
NewBritain,Conn.(10) S15	7.10	9.05	10.60	12.75	15.45
NewCastle,Pa. B4, E5	7.10	9.05	10.60	12.75	....
NewHaven,Conn. D2	7.55	9.35	10.90	13.05	....
NewKensington,Pa. A6	7.10	9.05	10.60	....	....
New York W3	...	9.35	10.90	13.05	15.75
Pawtucket,R.I. N8	7.65	9.35	10.90	13.05	15.75
Riverdale,Ill. A1	7.20	9.05	10.60	12.75	15.45
Rome,N.Y.(32) R6	7.10	9.05	10.60	12.75	15.45
Sharon,Pa. S3	7.10	9.05	10.60	12.75	15.45
Trenton,N.J. R5	...	9.35	10.90	13.05	15.75
Wallingford,Conn. W2	7.55	9.35	10.90	13.05	15.75
Warren,O. T5	7.10	9.05	10.60	12.75	15.45
Weirton,W.Va. W6	7.10	9.05	10.60	12.75	15.45
Worcester,Mass. A7, T6	7.65	9.35	10.90	13.05	15.75
Youngstown C8	7.10	9.05	10.60	12.75	15.45

Spring Steel (Tempered)

Spring Steel (Tempered)	0.26-0.40C	0.41-0.60C	0.61-0.80C	0.81-1.05C	1.06-1.35C
Bristol,Conn. W1	...	...	14.80	18.15	....
Buffalo W12	...	...	14.80	....	....
FranklinPark,Ill. T6	...	...	15.15	18.50	22.35
Harrison,N.J. C18	...	...	14.80	18.15	22.00
NewYork W3	...	...	14.80	18.15	22.00
Trenton,N.J. R5	...	...	14.80	18.15	22.00
Worcester,Mass. W12	...	...	14.80	....	....
Worcester,Mass. A7, T6	...	...	14.80	18.15	22.00
Youngstown C8	...	...	15.15	18.50	22.35

STRIP, Electrogalvanized

Cleveland A7	6.25*
Dover,O. G6	6.25*
Riverdale,Ill. A1	6.35*
Warren,O. T5	6.25*
Warren,O. B9	6.45*
Worcester,Mass. A7	6.80*
Youngstown C8	6.25*

*Plus galvanizing extras.

STRIP, Galvanized (Continuous)

Sharon,Pa. S3	6.55

TIGHT COOPERAGE HOOP

Atlanta A11	5.05
Riverdale,Ill. A1	4.90
Sharon,Pa. S3	4.75
Youngstown U5	4.75

SILICON STEEL

H.R. SHEETS(22 Ga.,cut lengths)	Field	Armature	Electric	Motor	Dynamo
BeechBottom,W.Va. W10	...	...	9.95	10.95	11.85
Brackenridge,Pa. A4	...	...	9.95	10.95	11.85
Mansfield,O. E6	8.40	9.35	9.95	10.95	11.85
Newport,Ky. N9	8.40	9.35	9.95	10.95	11.85
Niles,O. M21	8.40	9.35	9.95	10.95	....
Vandergrift,Pa. U5	...	9.35	9.95	10.95	11.85
Warren,O. R2	8.40	9.35	9.95	10.95	11.85
Zanesville,O. A10	...	9.35	9.95	10.95	11.85

C.R. COILS & CUT LENGTHS, (22 Ga.) Fully Processed (Semiprocessed ½c lower)	Field	Armature	Electric	Motor	Dynamo
Brackenridge Pa. A4	...	....	10.70	11.70	12.60
GraniteCity,Ill. G4	8.80*	9.80*	10.40*	11.40*	....
IndianaHarbor,Ind. I-2	8.60†	9.60*	10.20*	11.20*	....
Vandergrift,Pa. U5	8.60*	9.60*	10.20*	11.20*	12.10*
Vandergrift,Pa. U5	...	10.10†	10.70†	11.70†	12.60†
Warren,O. R2	8.60†	10.10	10.70	11.70	12.60

H.R. SHEETS (22 Ga., cut lengths)	Transformer Grade T-72	T-65	T-58	T-52
BeechBottom,W.Va. W10	12.80	13.35	13.85	14.85
Brackenridge,Pa. A4	12.80	....	....	....
Newport,Ky. N9	12.80	....	....	....
Vandergrift,Pa. U5	12.80	13.35	13.85	14.85
Zanesville,O. A10	12.80§	13.35§	13.85§	14.85§

C.R. COILS & CUT LENGTHS (22 Ga.)	Grain Oriented T-100	T-90	T-80	T-73	T-66	T-72
Brackenridge,Pa. A4	....	15.85	17.45	17.95	18.45	13.55**
Butler,Pa. A10	....	....	17.45	17.95	....	....
Vandergrift,Pa. U5	14.85	15.85	17.45	17.95	....	13.55
Warren,O. R2	....	....	....	....	....	13.55‡

*Semiprocessed. †Fully processed only. ‡Coils, annealed, semiprocessed ½c lower. §Coils, ¾-cent higher. **Cut lengths, ¾-cent lower.

TIN MILL PRODUCTS

TIN PLATE Electrolytic (Base Box)	0.25 lb	0.50 lb	0.75 lb
Aliquippa,Pa. J5	$7.90	$8.15	$8.55
Dravosburg,Pa. U5	7.90	8.15	8.55
Fairfield,Ala. T2	8.00	8.25	8.65
Fairless,Pa. U5	8.00	8.25	8.65
Gary,Ind. U5	7.90	8.15	8.55
GraniteCity,Ill. G4	8.00	8.25	8.65
IndianaHarbor,Ind. I-2, Y1	7.90	8.15	8.55
Niles,O. R2	7.90	8.15	8.55
Pittsburg,Calif. C11	8.65	8.90	9.30
SparrowsPoint,Md. B2	8.00	8.25	8.65
Weirton,W.Va. W6	7.90	8.15	8.55
Yorkville,O. W10	7.90	8.15	8.55
ELECTROTIN (22-27 Gage; Dollars per 100 lb)			
Aliquippa,Pa. J5	6.675	....	....
Niles,O. R2	6.675	6.875	7.075

TINPLATE, American Coke (Base Box)	1.25 lb	1.50 lb
Aliquippa,Pa. J5	$9.20	$9.45
Dravosburg,Pa. U5	9.20	9.45
Fairfield,Ala. T2	9.30	9.55
Fairless,Pa. U5	9.30	9.55
Gary,Ind. U5	9.20	9.45
Ind.Har. I-2, Y1	9.20	9.45
Pitts.,Calif. C11	9.95	10.20
Sp.Pt.,Md. B2	9.30	9.55
Weirton,W.Va. W6	9.20	9.45
Yorkville,O. W10	9.20	9.45

BLACK PLATE (Base Box)

Aliquippa,Pa. J5	$7.00
Dravosburg,Pa. U5	7.00
Fairfield,Ala. T2	7.10
Fairless,Pa. U5	7.10
Gary,Ind. U5	7.00
GraniteCity,Ill. G4	7.10
Ind.Harbor,Ind. I-2, Y1	7.00
Niles,O. R2	7.00
Pittsburg,Calif. C11	7.75
SparrowsPoint,Md. B2	7.10
Warren,O. R2	7.00
Weirton,W.Va. W6	7.00
Yorkville,O. W10	7.00

HOLLOWARE ENAMELING Black Plate (29 Gage)

Dravosburg,Pa. U5	6.65
Gary,Ind. U5	6.65
GraniteCity,Ill. G4	6.75
Ind.Harbor,Ind. Y1	6.65
Yorkville,O. W10	6.65

MANUFACTURING TERNES (Special Coated; Base Box)

Dravosburg,Pa. U5	$8.70
Gary,Ind. U5	8.70
Yorkville,O. W10	8.70

MANUFACTURING TERNES (Light Coated, 6 lb; Base Box)

Yorkville,O. W10	$9.15

ROOFING SHORT TERNES (8 lb Coated; Base Box)

Gary,Ind. U5	$10.25

WIRE

WIRE, Manufacturers Bright, Low Carbon

AlabamaCity,Ala. R2	6.60
Aliquippa,Pa. J5	6.60
Alton,Ill. L1	6.775
Atlanta A11	6.80
Bartonville,Ill. K4	6.70
Buffalo W12	6.60
Chicago W13	6.60
Cleveland A7	6.60
Crawfordsville,Ind. M8	6.70
Donora,Pa. A7	6.60
Duluth,Minn. A7	6.60
Fairfield,Ala. T2	6.60
Fostoria,O.(24) S1	6.80
Houston S5	6.85
Jacksonville,Fla. M8	6.95
Johnstown,Pa. B2	6.60
Joliet,Ill. A7	6.60
KansasCity,Mo. S5	6.85
Kokomo,Ind. C16	6.70
LosAngeles B3	7.55
Minnequa,Colo. C10	6.85
Monessen,Pa. P7	6.60
Newark 6-8 ga. I-1	6.90
N.Tonawanda B11	6.60
Palmer,Mass. W12	6.90
Pittsburg,Calif. C11	7.20
Portsmouth,O. P12	6.60
Rankin,Pa. A7	6.60
S.Chicago,Ill. R2	6.60
S.SanFrancisco C10	7.55
SparrowsPoint,Md. B2	6.70
Sterling,Ill.(1) N15	6.60
Sterling,Ill. N15	6.70
Struthers,O. Y1	6.60
Waukegan,Ill. A7	6.60
Worcester,Mass. A7	6.90

WIRE, MB Spring, High Carbon

Aliquippa,Pa. J5	7.90
Alton,Ill. L1	8.075
Bartonville,Ill. K4	8.00
Buffalo W12	7.90
Cleveland A7	7.90
Donora,Pa. A7	7.90
Duluth,Minn. A7	7.90
Fostoria,O. S1	7.95
Johnstown,Pa. B2	7.90
LosAngeles B3	8.85
Milbury,Mass.(12) N6	8.20
Minnequa,Colo. C10	8.15
Monessen,Pa. P16	7.90
Muncie,Ind. I-7	8.10
Palmer,Mass. W12	8.20
Pittsburg,Calif. C11	8.85
Portsmouth,O. P12	7.90
Roebling,N.J. R5	8.20
S.Chicago,Ill. R2	7.90
S.SanFrancisco C10	8.85
SparrowsPt.,Md. B2	8.00
Struthers,O. Y1	7.90
Trenton,N.J. A7	8.20
Waukegan,Ill. A7	7.90
Worcester A7,J4,T6,W12	8.20

WIRE, Upholstery Spring

Aliquippa,Pa. J5	7.60
Alton,Ill. L1	7.775
Buffalo W12	7.60
Cleveland A7	7.60
Donora,Pa. A7	7.60
Duluth,Minn. A7	7.60
Johnstown,Pa. B2	7.60
KansasCity,Mo. S5	7.85
LosAngeles B3	8.55
Minnequa,Colo. C10	7.775
Monessen,Pa. P16	7.60
NewHaven,Conn. A7	7.90
Palmer,Mass. W12	7.90
Pittsburg,Calif. C11	8.55
Portsmouth,O. P12	7.60
Roebling,N.J. R5	7.90
S.Chicago,Ill. R2	7.60
S.SanFrancisco C10	8.55
SparrowsPoint,Md. B2	7.70
Struthers,O. Y1	7.60
Trenton,N.J. A7	7.90
Waukegan,Ill. A7	7.60
Worcester,Mass. A7	7.90

WIRE, Fine & Weaving (8"Coils)

Alton,Ill. L1	12.725
Bartonville,Ill. K4	12.65
Buffalo W12	12.55
Chicago W13	12.55
Cleveland A7	12.55
Crawfordsville,Ind. M8	12.65
Fostoria,O. S1	12.55
Jacksonville,Fla. M8	12.90
Johnstown,Pa. B2	12.55
Kokomo,Ind. C16	12.55
Minnequa,Colo. C10	12.30
Monessen,Pa. P6	12.55
Muncie,Ind. I-7	12.75
Palmer,Mass. W12	12.85
Roebling,N.J. R5	12.85
S.SanFrancisco C10	12.90
Waukegan,Ill. A7	12.55
Worcester,Mass. A7,T6	12.85

WIRE, Gal'd ACSR for Cores

Bartonville,Ill. K4	10.70
Buffalo W12	10.70
Johnstown,Pa. B2	10.70
Minnequa,Colo. C10	10.825
Monessen,Pa. P16	10.70
Muncie,Ind. I-7	10.90
Palmer,Mass. W12	11.00
Pittsburg,Calif. C11	11.50
Portsmouth,O. P12	10.70
Roebling,N.J. R5	11.00
SparrowsPt.,Md. B2	10.80
Struthers,O. Y1	10.70

ROPE WIRE

ROPE WIRE	(A)
Bartonville,Ill. K4	10.55
Buffalo W12	10.55
Fostoria,O. S1	10.55
Johnstown,Pa. B2	10.55
Monessen,Pa. P16	10.55
Muncie,Ind. I-7	10.75
Palmer,Mass. W12	10.85
Portsmouth,O. P12	10.55
Roebling,N.J. R5	10.85
SparrowsPt. B2	10.65
Struthers,O. Y1	10.55
Worcester,Mass. J4	10.85

(A) Plow and Mild Plow; add 0.25c for Improved Plow.

WIRE
(Continued)

WIRE, Tire Bead

Bartonville,Ill. K4	14.15
Monessen,Pa. P16	14.20
Roebling,N.J. R5	14.35

WIRE, Cold-Rolled Flat

Anderson,Ind. G6	9.50
Baltimore T6	9.80
Boston T6	9.80
Buffalo W12	9.50
Cleveland A7	9.50
Crawfordsville,Ind. M8	9.00
Dover,O. G6	9.50
Fostoria,O. S1	9.50
FranklinPark,Ill. T6	9.60
Kokomo,Ind. C16	9.50
Massillon,O. R8	9.50
Milwaukee C23	9.70
Monessen,Pa. P16	9.00
Pawtucket,R.I. N8	9.80
Riverdale,Ill. A1	9.60
Rome,N.Y. R6	9.50
Trenton,N.J. R5	9.80
Worcester A7, T6, W12	9.80

NAIL, Stock

To Dealers & Mfrs. (7)	Col.
AlabamaCity,Ala. R2	152
Aliquippa,Pa. J5	152
Atlanta A11	154
Bartonville,Ill. K4	154
Chicago,Ill. W13	152
Cleveland A9	157
Crawfordsville,Ind. M8	154
Donora,Pa. A7	152
Duluth,Minn. A7	152
Fairfield,Ala. T2	152
Galveston,Tex. D7	157
Houston,Tex. S5	157
Jack'ville,Fla.(23) M8	162
Johnstown,Pa. B2	152
Joliet,Ill. A7	152
KansasCity,Mo. S5	157
Kokomo,Ind. C16	154
Minnequa,Colo. C10	157
Monessen,Pa. P7	152
Pittsburg,Calif. C11	171
Rankin,Pa. A7	152
S.Chicago,Ill. R2	152
SparrowsPt.,Md. B2	154
Sterling,Ill.(1) N15	152
Worcester,Mass. A7	158

NAILS, CUT (100 lb keg)

To Dealers (33)	
Conshohocken,Pa. A3	$9.05
Wheeling,W.Va. W10	9.05

STAPLES, Polished Stock

To Dealers & Mfrs. (7)	Col.
AlabamaCity,Ala. R2	152
Aliquippa,Pa. J5	152
Atlanta A11	154
Bartonville,Ill. K4	154
Crawfordsville,Ind. M8	154
Donora,Pa. A7	152
Duluth,Minn. A7	152
Fairfield,Ala. T2	152
Jack'ville,Fla.(23) M8	162
Johnstown,Pa. B2	152
Joliet,Ill. A7	152
Kokomo,Ind. C16	154
Minnequa,Colo. C10	157
Monessen,Pa. P7	152
Pittsburg,Calif. C11	171
Rankin,Pa. A7	152
S.Chicago,Ill. R2	152
SparrowsPt., Md. B2	154
Sterling,Ill.(1) N15	152
Worcester,Mass. A7	158

TIE WIRE, Automatic Baler (14½ Ga.) (Per 97 lb Net Box)

Coil No. 3150	
AlabamaCity,Ala. R2	$9.45
Bartonville,Ill. K4	9.45
Buffalo W12	*9.45*
Crawfordsville,Ind. M8	9.45
Donora,Pa. A7	9.45
Duluth,Minn. A7	9.45
Jacksonville,Fla. M8	9.88
Johnstown,Pa. B2	9.45
Joliet,Ill. A7	9.45
Kokomo,Ind. C16	9.45
LosAngeles B3	*10.24*
Minnequa,Colo. C10	9.60
Pittsburg,Calif. C11	10.23
S.Chicago,Ill. R2	9.45
SparrowsPt.,Md. B2	9.55
Sterling,Ill. N15	9.35

Coil No. 6500 Stand.	
AlabamaCity,Ala. R2	$9.75
Bartonville,Ill. K4	9.75
Buffalo W12	*9.75*
Crawfordsville,Ind. M8	9.75
Donora,Pa. A7	9.75
Duluth,Minn. A7	9.75
Jacksonville,Fla. M8	10.18
Johnstown,Pa. B3	9.75
Joliet,Ill. A7	9.75
Kokomo,Ind. C16	9.75
LosAngeles B3	*10.65*
Minnequa,Colo. C10	9.90
Pittsburg,Calif. C11	10.55
S.Chicago,Ill. R2	9.75
SparrowsPt.,Md. B2	9.85
Sterling,Ill. N15	9.65

Coil No. 6500 Interim	
AlabamaCity,Ala. R2	$9.80
Bartonville,Ill. K4	9.80
Buffalo W12	*9.80*
Crawfordsville,Ind. M8	9.80
Donora,Pa. A7	9.80
Duluth,Minn. A7	9.80
Jacksonville,Fla. M8	10.23
Johnstown,Pa. B2	9.80
Joliet,Ill. A7	9.80
Kokomo,Ind. C16	9.80
LosAngeles B3	*10.60*
Minnequa,Colo. C10	9.95
Pitsburg,Calif. C11	10.60
S.Chicago,Ill. R2	9.80
SparrowsPt.,Md. B2	9.90
Sterling,Ill. N15	9.70

WIRE, Barbed

	Col.
AlabamaCity,Ala. R2	175**
Aliquippa,Pa. J5	172§
Atlanta A11	181
Bartonville,Ill. K4	181
Crawfordsville,Ind. M8	181
Donora,Pa. A7	175†
Duluth,Minn. A7	175†
Fairfield,Ala. T2	175†
Houston,Tex. S5	180**
Jacksonville,Fla. M8	186
Johnstown,Pa. B2	179*
Joliet,Ill. A7	175†
KansasCity,Mo. S5	180**
Kokomo,Ind. C16	177†
Minnequa,Colo. C10	180**
Monessen,Pa. P7	178††
Pittsburg,Calif. C11	195†
Rankin,Pa. A7	175†
S.Chicago,Ill. R2	175**
S.SanFrancisco C10	195**
SparrowsPoint,Md. B2	181*
Sterling,Ill.(1) N15	179††

WOVEN FENCE, 9-15 ga.

	Col.
Ala.City,Ala. R2	152**
Ala.City, 17 ga. R2	257**
Aliq'ppa,Pa.9-14½ga J5	165§
Atlanta A11	168
Bartonville,Ill. K4	168
Crawfordsville,Ind. M8	168
Donora,Pa. A7	162†
Duluth,Minn. A7	162†
Fairfield,Ala. T2	162†
Houston,Tex. S5	167**
Jacksonville,Fla. M8	173
Johnstown,Pa.(43) B2	166
Joliet,Ill. A7	162†
KansasCity,Mo. S5	167**
Kokomo,Ind. C16	164†
Minnequa,Colo. C10	167**
Monessen,Pa. 9 ga. P17	166††
Pittsburg,Calif. C11	185†
Rankin,Pa. A7	162†
S.Chicago,Ill. R2	162**
Sterling,Ill.(1) N15	166††

WIRE (16 Gage)

	An'ld Stone	Galv. Stone
Ala.City R2	14.50	16.05**
Bartonville K4	14.50	16.55
Buffalo W12	14.50	....
Cleveland A7	14.50	....
Crawf'dsville M8	14.60	16.55
Fostoria,O. S1	14.60	16.15†
Jacksonville M8	14.85	16.80
Johnstown B2	14.50	16.40*
Kokomo C16	14.60	16.15†
Minnequa C10	14.75	16.45**
Palmer,MassW12	14.50	16.05*
Pitts.,Calif. C11	14.85	16.40†
S.Chicago R2	14.50	16.05**
SparrowsPt. B2	14.60	16.50*
Sterling(1) N15	14.50	16.45††
Waukegan A7	14.50	16.05
Worcester A7	14.80	....

WIRE, Merchant Quality

(6 to 8 gage)	An'ld	Galv.
Ala.City,Ala. R2	7.50	7.90**
Aliquippa J5	7.40	7.925§
Atlanta A11	7.60	8.20
Bartonville(48) K4	7.60	8.20
Buffalo W12	*7.50*	*7.90†*
Cleveland A7	7.50	....
Crawfordsville M8	7.50	8.10
Donora,Pa. A7	7.50	7.90†
Duluth,Minn. A7	7.50	7.90†
Fairfield T2	7.50	7.90†
Houston(48) S5	7.65	8.05**
Jacks'ville,Fla.M8	7.75	8.35
Johnstown B2(48)	7.50	8.10*
Joliet,Ill. A7	7.50	7.90†
Kans.City(48) S5	7.65	8.05**
Kokomo C16	7.50	7.90†
LosAngeles B3	*8.45*	*9.05**
Minnequa C10	7.65	8.05**
Monessen P7(48)	7.40	8.00††
Palmer,Mass. W12	*7.80*	*8.20†*
Pitts.,Calif. C11	8.45	8.85†
Portsmouth,O. P12	*7.50*	....
Rankin A7	7.50	7.90†
S.Chicago R2	7.50	7.90**
S.SanFran. C10	8.35	8.75**
Spar'wsPt. B2(48)	7.60	8.20*
Str'ing(1)(48)N15	7.40	8.00††
Struthers,O.(48)Y1	7.40	7.90‡
Worcester,Mass.A7	7.80	8.20†

Based on zinc price of: *13.50c. †5c. §10c. ‡Less than 10c. ††13c. **Subject to zinc equalization extras.

BALE TIES, Single Loop

	Col.
AlabamaCity,Ala. R2	175
Atlanta A11	175
Bartonville,Ill. K4	177
Crawfordsville,Ind. M8	175
Donora,Pa. A7	175
Duluth,Minn. A7	175
Fairfield,Ala. T2	175
Jacksonville,Fla. M8	180
Joliet,Ill. A7	175
Houston S5	178
KansasCity,Mo. S5	178
Kokomo,Ind. C16	175
Minnequa,Colo. C10	178
Pitts.,Calif. C11	199
S.Chicago R2	175
S.SanFran.,Calif. C10	197
SparrowsPoint,Md. B2	177
Sterling,Ill.(1) N15	173

FENCE POSTS

	Col.
ChicagoHts.,Ill. C2, I-2	157
Duluth,Minn. A7	157
Franklin,Pa. F5	157
Huntington,W.Va. W7	157
Johnstown,Pa. B2	157
Marion,O. P11	157
Minnequa,Colo. C10	162
Moline,Ill. R2	162
S.Chicago,Ill. R2	157
Tonawanda,N.Y. B12	157
Williamsport,Pa. S10	160

FASTENERS

(Base discounts, full case quantity, per cent off list to consumer, f.o.b. mill)

Carriage, Machine Bolts	
Full-Size Body (cut thread)	
†½" x 6" and smaller	61
Larger than ½" diam. and all diams. longer than 6"	55
Under-Size Body (rolled thread; not nutted):	
½" x 6" and smaller.	61

†½" x 4" and smaller and shorter are not nutted.

Carriage, Machine & Lag Bolts, Hot Galvanized:	
½" and smaller	42
Larger than ½" diam. and all diams. longer than 6"	32
Lag Bolts	
All diams. & 6" and shorter	61
All diams. longer than 6"	55
Plow, Tap & Blank Bolts	
½" x 6" and smaller.	61
Larger than ½" diam. and all diams. longer than 6"	55
Ribbed Neck, Carriage, Step, Elevator, Fitting-up and Tire Bolts:	
All sizes	61

STOVE BOLTS, SLOTTED
(nuts not attached; bulk)

⅛" to ¼" diam. incl., 3" or shorter:	
25,000 to 199,999 pieces	61
200,000 or more pieces	64
$\frac{5}{16}$" to ½" diam. incl., 3" or shorter:	
15,000 to 99,999 pieces	61
100,000 or more pieces	64
Longer than 3", any diam.:	
5000 to 99,999 pieces	61
100,000 or more pieces	64

RIVETS

F.o.b. Cleveland and/or freight equalized with Pittsburgh, f.o.b. Chicago, and/or freight equalized with Birmingham except where equalization is too great.

Structural ½-in., larger	9.95
$\frac{7}{16}$-in. under..	List less 32%

BOILER TUBES

Net base c.l. prices, dollars per 100 ft, mill; minimum wall thickness, cut lengths 10 to 24 ft, inclusive.

O.D. In.	B.W. Gage	Seamless H.R.	Seamless C.D.	Elec. Weld H.R.
1	13	....	21.06	20.42
1¼	13	....	24.94	20.45
1½	13	23.31	27.57	22.61
1¾	13	27.54	32.57	26.71
2	13	30.87	36.51	29.93
2¼	13	34.77	41.12	33.72
2¼	12	37.73	44.63	36.60
2½	12	41.57	49.16	40.31
2¾	12	45.00	53.22	43.65
3	12	47.99	56.76	46.55

RAILWAY MATERIALS

RAILS	Standard No. 1	Standard No. 2	All No. 2	Tee Rails 60 lb Under
Bessemer,Pa. U5	4.725	4.625	4.675	5.65
Ensley,Ala. T2	4.725	4.625	....	5.65
Fairfield,Ala. T2	....	....	....	5.65
Gary,Ind. U5	4.725	4.625	4.675	...
Huntington,W.Va. W7	....	....	....	5.65
IndianaHarbor,Ind. I-2	4.725	4.625	4.675	...
Johnstown,Pa. B2	....	....	...	(16)5.65
Lackawanna,N.Y. B2	4.725	4.625	...	(16)5.65
Minnequa,Colo. C10	4.725	4.625	....	6.15
Steelton,Pa. B2	4.725	4.625	....	...
Williamsport,Pa. S19	....	....	....	5.65

TIE PLATES

Fairfield,Ala. T2	5.625
Gary,Ind. U5	5.625
Ind.Harbor,Ind. I-2	5.625
Lackawanna,N.Y. B2	5.625
Minnequa,Colo. C10	5.625
Seattle B3	5.775
Steelton,Pa. B2	5.625
Torrance,Calif. C11	5.775

TRACK BOLTS, Untreated

Cleveland R2	12.15
KansasCity,Mo. S5	12.90*
Lebanon,Pa. B2	12.15
Minnequa,Colo. C10	12.15
Pittsburgh O3, P14	12.15
Seattle B3	12.65

*Treated

AXLES

Ind.Harbor,Ind. S13	7.50
Johnstown,Pa. B2	7.50

JOINT BARS

Bessemer,Pa. U5	5.825
Fairfield,Ala. T2	5.825
Ind.Harbor,Ind. I-2	5.825
Joliet,Ill. U5	5.825
Lackawanna,N.Y. B2	5.825
Minnequa,Colo. C10	5.825
Steelton,Pa. B2	5.825

SCREW SPIKES

Cleveland R2	11.90
Pittsburgh O3	11.90

STANDARD TRACK SPIKES

Fairfield,Ala. T2	8.05
Ind.Harbor,Ind. I-2, Y1	7.90
KansasCity,Mo. S5	7.90
Lebanon,Pa. B2	8.05
Minnequa,Colo. C10	7.90
Pittsburgh J5	8.05
Seattle B3	*8.55*
S.Chicago,Ill. R2	8.05
Struthers,O. Y1	7.90
Youngstown R2	8.05

METAL POWDER

(Per pound f.o.b. shipping point in ton lots for minus 100 mesh, except as noted)

	Cents
Sponge iron:	
98+% Fe, annealed.	9.25
Swedish, c.i.f., Camden, N. J., c.l. in bags ..	9.50
Domestic:	
f.o.b., Johnstown, Pa., Niagara Falls, N.Y., in bags	9.50
F.o.b. Riverton, N.J., in bags	8.50
Canadian, f.o.b. shipping point	9.50
Electrolytic iron:	
Melting stock, 99.9% Fe, irregular fragments of ⅛ in. x 1.3 in.	22.00
Annealed, 99.5% Fe.	36.50
Unannealed (99+% Fe)	34.00
Unannealed (99+% Fe) (minus 325 mesh)	57.00
Powder Flakes (minus 16, plus 100 mesh)..	31.00
Carbonyl Iron:	
98.1-99.9%, 3 to 20 microns, depending on grade, 86.00-275.00, in standard 200-lb. containers; all minus 200 mesh.	
Aluminum:	
Atomized, 500 lb, drum frght. allowed	
Carlots	34.50
Ton lots	36.50
Antimony, 500 lb lots	32.00*
Brass, 5000-lb lots	41.75-65.25†
Bronze, 5000-lb lots	67.50-71.75†
Copper:	
Electrolytic	14.25*
Reduced	14.25*
Lead	7.50*
Manganese:	
Minus 35 mesh	64.00
Minus 100 mesh	70.00
Minus 200 mesh	75.00
Nickel, unannealed ...	$1.00
Nickel-Silver, 5000-lb lots	62.75-65.25†
Phosphor-Copper, 5000-lb lots	68.75
Silicon	47.50
Solder	7.00*
Stainless Steel, 302 ..	99.00
Stainless Steel, 316 ..	$1.32
Tin	14.50*
Zinc 5000-lb lots	19.25-33.00‡
Tungsten	Dollars
Melting grade, 99% 60 to 200 mesh:	
1000 lb and over...	4.50
Less than 1000 lb..	4.65
Chromium, electrolytic 99.8% Cr min. metallic basis	5.00

*Plus cost of metal. †Depending on composition. ‡Depending on mesh. §70% Cu, 20% Zn, 10% Ni. **64% Cu, 18% Zn, 18% Ni.

Footnotes

(1) Chicago base.
(2) Angles, flats, bands.
(3) Merchant.
(4) Reinforcing.
(5) 1⅛-in. to less than 1 7/16-in.
(6) Chicago or Birm. base.
(7) To jobbers, 3 cols. lower.
(8) 16 Ga. and heavier.
(9) Merchant quality; add 0.35c for special quality.
(10) Pittsburgh base.
(11) Cleveland & Pitts. base.
(12) Worcester, Mass., base.
(13) Add 0.25c for 17 Ga. & heavier.
(14) Gage 0.143 to 0.249 in.; for gage 0.142 and lighter, 5.80c.
(15) ⅜" and thinner.
(16) 40 lb and under.
(17) Flats only; 0.25 in. & heavier.
(18) To dealers.
(19) Chicago & Pitts. base.
(21) New Haven, Conn., base.
(22) Deld. San Francisco Bay area.
(23) Plus 4c per 100 lb.
(24) Deduct 0.10c, finer than 15 Ga.
(25) Bar mill bands.
(26) Delivered in mill zone, 5.25c.
(27) Bar mill sizes.
(28) Bonderized.
(29) Youngstown base.
(30) Sheared; for universal mill add 0.45c.
(31) Widths over ⅝-in.; 6.90c for widths ⅝-in. and under by 0.125 in. and thinner.
(32) Buffalo base.
(33) To jobbers, deduct 20c.
(34) 9.60c for cut lengths.
(35) 72" and narrower.
(36) 54" and narrower.
(37) 13 Ga. & heavier; 60" & narrower.
(38) 14 Ga. & Lighter; 48" & narrower.
(39) 48" and narrower.
(40) Lighter than 0.035"; 0.035" and heavier, 0.25c higher.
(41) 9.10c for cut lengths.
(42) Mill lengths, f.o.b. mill; deld. in mill zone or within switching limits, 5.25c.
(43) 9-14½ Ga.
(48) 6-7 Ga.
(49) 3½-in. and smaller rounds; 7.95c over 3½-in. and other shapes.

SEAMLESS STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	2		2½		3		3½		4		5		6	
List Per Ft	37c		58.5c		76.5c		92c		$1.09		$1.48		$1.92	
Pounds Per Ft	3.68		5.82		7.62		9.20		10.89		14.81		19.18	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	6.5	+11.5	10.5	+8.25	13	+5.75	14.5	+4.25	14.5	+4.25	14	+4.75	16.5	+2.25
Ambridge, Pa. N2	6.5	...	10.5	....	13	....	14.5	....	14.5	....	14	....	16.5	....
Lorain, O. N3	6.5	+11.5	10.5	+8.25	13	+5.75	14.5	+4.25	14.5	+4.25	14	+4.75	16.5	+2.25
Youngstown Y1	6.5	+11.5	10.5	+8.25	13	+5.75	14.5	+4.25	14.5	+4.25	14	+4.75	16.5	+2.25

ELECTRIC WELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Youngstown R2	6.5	+11.5	10.5	+8.25	13	+5.75	14.5	+4.25	14.5	+4.25	14	+4.75	16.5	+2.25

BUTTWELD STANDARD PIPE, Threaded and Coupled

Carload discounts from list, %

Size—Inches	⅛		¼		⅜		½		¾		1		1¼	
List Per Ft	5.5c		6c		6c		8.5c		11.5c		17c		23c	
Pounds Per Ft	0.24		0.42		0.57		0.85		1.13		1.68		2.28	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	....	....	....	....	....	....	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5
Alton, Ill. L1	....	....	....	....	....	....	16.5	+2.75	19.5	1.25	22	4.75	24.5	6.5
Benwood, W. Va. W10	17.5	+13	9	+18.5	+0.75	+28.5	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5
Butler, Pa. F6	18	+12.5	9.5	+18	1.5	+26	....	....	....	....	....	....	....	....
Etna, Pa. N2	....	....	....	....	....	....	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5
Fairless, Pa. N3	....	....	....	....	....	....	16.5	+2.75	19.5	1.25	22	4.75	24.5	6.5
Fontana, Calif. K1	....	....	....	....	....	....	6	+13.25	9	+9.25	11.5	+5.75	14	+4
Ind. Harbor, Ind. Y1	....	....	....	....	....	....	17.5	+1.75	20.5	2.25	23	5.75	25.5	7.5
Lorain, O. N3	....	....	....	....	....	....	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5
Sharon, Pa. S4	18	+12.5	9.5	+18	1.5	+26	....	....	....	....	....	....	....	....
Sharon, Pa. M6	....	....	....	....	....	....	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5
Sparrows Pt., Md. B2	16	+12.5	7.5	+18	+0.5	+25	16.5	+0.75	19.5	3.25	22	6.75	24.5	8
Youngstown R2, Y1	....	....	....	....	....	....	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5
Wheatland, Pa. W9	18	+12.5	9.5	+18	1.5	+26	18.5	+0.75	21.5	3.25	24	6.75	26.5	8.5

Size—Inches	1½		2		2½		3		3½		4	
List Per Ft	27.5c		37c		58.5c		76.5c		92c		$1.09	
Pounds Per Ft	2.73		3.68		5.82		7.62		9.20		10.89	
	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*	Blk	Galv*
Aliquippa, Pa. J5	27	9.5	27.5	10	29	10.75	29	10.75	....	....	....	....
Alton, Ill. L1	25	7.5	25.5	8	27	8.75	27	8.75	....	....	....	....
Benwood, W. Va. W10	27	9.5	27.5	10	29	10.75	29	10.75	19.5	0.75	19.5	0.75
Etna, Pa. N2	27	9.5	27.5	10	29	10.75	29	10.75	19.5	0.75	19.5	0.75
Fairless, Pa. N3	25	7.5	25.5	8	27	8.75	27	8.75	17.5	+1.25	17.5	+1.25
Fontana, Calif. K1	14.5	+3	15	+2.5	16.5	+1.75	16.5	+1.75	7	+11.75	7	+11.75
Ind. Harbor, Ind. Y1	26	8.5	26.5	9	28	9.75	28	9.75	18.5	+0.25	18.5	+0.25
Lorain, O. N3	27	9.5	27.5	10	29	10.75	29	10.75	....	....	....	....
Sharon, Pa. M6	27	9.5	27.5	10	29	10.75	29	10.75	....	....	....	....
Sparrows Pt., Md. B2	25	9	25.5	9.5	27	9.75	27	9.75	17.5	+0.25	17.5	+0.25
Wheatland, Pa. W9	27	9.5	27.5	10	29	10.75	29	10.75	19.5	0.75	19.5	0.75
Youngstown R2, Y1	27	9.5	27.5	10	29	10.75	29	10.75	19.5	0.75	19.5	0.75

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*Galvanized pipe discounts based on current price of zinc (13.50c, East St. Louis).

Stainless Steel

Representative prices, cents per pound; subject to current lists of extras

AISI Type	—Rerolling— Ingot	Slabs	Forging Billets	Seamless Tube Billets	H.R. Strip	Wire Rods; C.F. Wire	Bars; Structural Shapes	Plates	Sheets	C.R. Strip; Flat Wire
201	18.50	23.00	....	....	31.00	....	....	....	42.25	39.00
202	19.75	25.50	31.00	36.25	33.50	....	36.75	38.75	42.50	42.50
301	19.25	23.75	....	36.75	32.00	36.00	38.00	....	44.25	41.00
302	20.50	26.25	32.00	37.25	34.50	36.25	38.25	40.25	44.50	44.50
302B	20.25	26.50	33.00	37.25	37.75	36.25	38.25	40.25	47.00	47.00
303	....	26.75	34.75	40.00	....	39.00	41.00	....	....	....
304	21.75	27.50	33.75	39.00	37.25	38.25	40.25	43.00	47.25	47.25
304L	....	....	38.75	44.00	42.25	43.25	45.25	48.00	52.25	52.25
305	23.25	30.25	....	39.50	40.25	38.25	40.25	43.50	50.25	50.25
308	23.50	30.50	38.50	44.25	41.25	43.25	45.50	49.75	52.00	52.00
309	31.00	39.75	46.75	53.50	53.50	52.00	54.75	58.25	67.00	67.00
310	37.25	48.00	62.25	72.25	68.50	69.75	73.50	75.25	78.75	78.75
314	....	....	....	....	....	69.75	....	75.25	....	....
316	31.50	40.25	51.25	59.50	58.25	57.75	60.75	64.00	68.25	68.25
316L	....	....	56.25	64.50	63.25	62.75	65.75	69.00	73.25	73.25
317	37.25	48.25	62.75	72.75	75.50	70.75	74.50	77.00	83.75	83.75
321	25.00	32.00	38.25	44.00	44.25	43.00	45.25	49.25	54.25	54.25
18-8CcTa	29.25	38.00	45.75	52.25	53.25	50.75	53.50	58.00	66.50	66.50
403	....	....	28.75	32.75	....	32.25	34.00	36.25	....	....
405	17.50	23.00	26.75	31.00	32.25	30.50	32.00	33.75	42.25	42.25
410	15.00	19.50	25.50	29.50	28.00	29.00	30.50	31.75	36.25	36.25
416	....	....	26.00	30.00	....	29.50	31.00	....	....	....
420	....	30.25	31.00	36.00	37.75	35.50	37.25	40.75	56.00	56.00
430	15.25	19.75	26.00	30.00	28.75	29.50	31.00	32.25	34.50	36.75
430F	....	....	26.50	30.50	....	30.00	31.50	....	....	....
431	....	25.50	33.25	....	....	37.25	39.25	40.75	....	....
446	....	....	35.50	40.50	53.25	40.00	42.00	43.25	63.25	63.25

Stainless Steel Producers Are: Allegheny Ludlum Steel Corp.; Alloy Metal Wire Co. Inc.; Alloy Tube Div., Carpenter Steel Co.; American Steel & Wire Div., U. S. Steel Corp.; Armco Steel Corp.; Babcock & Wilcox Co.; Bethlehem Steel Co.; J. Bishop & Co.; G. O. Carlson Inc.; Carpenter Steel Co.; Charter Wire Products Co.; Cold Metal Products Co.; Crucible Steel Co. of America; Damascus Tube Co.; Wilbur B. Driver Co.; Driver-Harris Co.; Eastern Stainless Steel Corp.; Ellwood Ivins Steel Tube Works Inc.; Firth Sterling Inc.; Ft. Wayne Metals Inc.; Globe Steel Tubes Co.; Helical Tube Co.; Indiana Steel & Wire Co.; Ingersoll Steel Div., Borg-Warner Corp.; Jessop Steel Co.; Johnson Steel & Wire Co. Inc.; Joslyn Mfg. & Supply Co.; Kenmore Metals Corp.; Maryland Fine & Specialty Wire Co.; McLouth Steel Corp.; Metal Forming Corp.; McInnes Steel Co.; National-Standard Co.; National Tube Div., U. S. Steel Corp.; Newman-Crosby Steel Co.; Pacific Tube Co.; Page Steel & Tube Div., American Chain & Cable Co. Inc.; Pittsburgh Rolling Mills Inc.; Republic Steel Corp.; Rodney Metals Inc.; Rome Mfg. Co.; Rotary Electric Steel Co.; Sharon Steel Corp.; Sawhill Tubular Products Inc.; Simonds Saw & Steel Co.; Specialty Wire Co. Inc.; Spencer Wire Corp.; Stainless Welded Products Inc.; Standard Tube Co.; Superior Steel Corp., Superior Tube Co.; Timken Roller Bearing Co.; Trent Tube Co.; Tube Methods Inc.; Ulbrich Stainless Steels; United States Steel Corp.; Universal-Cyclops Steel Co.; Wallingford Steel Co.; Washington Steel Corp.

Tool Steel

	—Plates— Carbon Base 10%	20%	Sheets Carbon Base 20%
302	....	....	30.50
304	30.30	36.05	32.50
304-L	32.30	37.95	....
310	41.30	47.00	....
316	35.50	41.40	47.00
316-L	40.00	46.10	....
316-CB	41.15	48.45	....
321	32.00	37.75	37.25
347	34.40	41.40	48.25
405	25.80	33.35	....
410	25.30	32.85	....
430	25.30	32.85	....
Inconel	49.45	65.45	....
Nickel	41.05	55.65	....
Nickel, Low Carbon	43.25	60.05	....
Monel	42.35	56.35	....
Copper*	....	....	46.00

	—Strip, Carbon Base— —Cold Rolled— 10%	Both Sides
Copper*	32.75	41.25

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*Deoxidized. Production points: Stainless-clad sheets. New Castle, Ind. I-4; stainless-clad plates, Claymont, Del. C22, Coatesville, Pa. L7, New Castle, Ind. I-4 and Washington, Pa. J3; nickel, inconel. monel-clad plates, Coatesville L7; copper-clad strip, Carnegie, Pa. S18.

Clad Steel

Grade	$ per lb	Grade	$ per lb
Regular Carbon	0.275	5% Cr Hot Work	0.430-0.460
Extra Carbon	0.330	W-Cr Hot Work	0.450
Special Carbon	0.390	V-Cr Hot Work	0.470
Oil Hardening	0.430	Hi-Carbon-Cr	0.770

Grade by Analysis (%)

W	Cr	V	Co	Mo	$ per lb
20.25	4.25	1.6	12.25	...	4.090
18.25	4.25	1	4.75	...	2.305-2.475
18	4	2	9	...	2.675-2.6775
18	4	2	....	...	1.765
18	4	1	....	...	1.600
13.75	3.75	2	5	...	2.245
13.5	4	3	....	...	1.865
9	3.5	..	....	...	1.180
6	4	2	....	5	1.105
6	4	3	....	6	1.350
1.5	4	1	....	8.5	0.960

Tool steel producers include: A4, A8, B2, B8, C4, C9, C13, C18, D4, F2, J3, M14, S8, U4, V2 and V3.

Pig Iron

F.o.b. furnace prices in dollars per gross ton, as reported to STEEL. Minimum delivered prices are approximate and do not include 3% federal tax.

Birmingham District	Basic	No. 2 Foundry	Malleable	Bessemer
AlabamaCity,Ala. R2	54.50	....	....	....
Birmingham R2	54.50	55.00‡	....	....
Birmingham U6	....	55.00‡	59.00	....
Woodward,Ala. W15	54.50	55.00‡	59.00	....
Cincinnati, deld.	....	62.70	....	....

Buffalo District	Basic	No. 2 Foundry	Malleable	Bessemer
Buffalo H1, R2	60.00	60.50	61.00	61.50
Tonawanda,N.Y. W12	60.00	60.50	61.00	61.50
N.Tonawanda,N.Y. T9	....	60.50	61.00	61.50
Boston, deld.	70.65	71.15	71.65	....
Rochester,N.Y. deld.	63.02	63.52	64.02	....
Syracuse,N.Y. deld.	64.12	64.62	65.12	....

Chicago District	Basic	No. 2 Foundry	Malleable	Bessemer
Chicago I-3	60.00	60.50	60.50	61.00
Gary,Ind. U5	60.00	....	60.50	....
S.Chicago R2	60.00	....	60.50	....
S.Chicago,Ill. Y1	60.00	60.50	60.50	61.00
S.Chicago,Ill. U5, W14	60.00	....	60.50	61.00
Milwaukee, deld.	62.30	62.80	62.80	63.30
Muskegon,Mich. deld.	....	67.18	67.18	....

Cleveland District	Basic	No. 2 Foundry	Malleable	Bessemer
Cleveland R2, A7	60.00	60.50	60.50	61.00
Akron,O. deld.	62.75	63.25	63.25	63.75

Mid-Atlantic District	Basic	No. 2 Foundry	Malleable	Bessemer
Bethlehem,Pa. B2	62.00	62.50	63.00	63.50
NewYork, deld.	....	66.51	67.01	....
Newark, deld.	65.20	65.70	66.20	66.70
Birdsboro,Pa. B10	62.00	62.50	63.00	63.50
Chester,Pa. P14	62.00	62.50	63.00	....
Philadelphia, deld.	63.76	64.26	64.70	....
Steelton,Pa. B2	62.00	62.50	63.00	63.50
Swedeland,Pa. A3	62.00	62.50	63.00	63.50
Philadelphia, deld.	63.76	64.26	64.76	65.26
Troy,N.Y. R2	62.00	62.50	63.00	63.50

Pittsburgh District	Basic	No. 2 Foundry	Malleable	Bessemer
NevilleIsland,Pa. P6	60.00	60.50	60.50	....
Pittsburgh (N&S sides), Aliquippa, deld.	....	61.95	61.95	62.48
McKeesRock, deld.	....	61.60	61.60	62.13
Lawrenceville,Homestead, Wilmerding,Monaca, deld.	....	62.26	62.26	62.79
Verona,Trafford, deld.	62.29	62.82	62.82	63.35
Brackenridge, deld.	62.60	63.10	63.10	63.63
Bessemer,Pa. U5	60.00	....	60.50	61.00
Clairton,Rankin,S.Duquesne,Pa. U5	60.00	....	....	....
Midland,Pa. C18	58.50	....	....	....

Youngstown District	Basic	No. 2 Foundry	Malleable	Bessemer
Hubbard,O. Y1	....	....	60.50	....
Sharpsville,Pa. S6	60.00	....	60.50	61.00
Youngstown Y1	....	....	60.50	61.00
Youngstown U5	60.00	....	....	61.00
Mansfield,O. deld.	64.90	....	65.40	65.90
Duluth I-3	60.00	60.50	60.50	61.00
Erie,Pa. I-3	60.00	60.50	60.50	61.00
Everett,Mass. E1	62.00	62.50	63.00	....
Fontana,Calif. K1	*67.50*	*68.00*	....	....
Geneva,Utah C11	60.00	60.50	....	....
GraniteCity,Ill. G4	60.40	60.90	61.40	....
Ironton,Utah C11	60.00	60.50	....	....
LoneStar,Texas L6	....	55.00*	....	....
Minnequa,Colo. C10	62.00	62.50	63.00	....
Rockwood,Tenn. T3	....	55.00‡	59.00	....
Toledo,O. I-3	60.00	60.50	60.50	61.00
Cincinnati, deld.	65.76	66.26	....	....

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*Phos. 0.51-0.75%; $56, Phos. 0.31-0.50%.
‡Intermediate (Phos. 0.31-0.69%), $56.

PIG IRON DIFFERENTIALS

Silicon: Add 50 cents per ton for each 0.25% Si or percentage thereof over base grade, 1.75-2.25%, except on low phos iron on which base is 1.75-2.00%.

Manganese: Add 50 cents per ton for each 0.50% manganese over 1% or portion thereof.

Nickel: Under 0.05% no extra; 0.50-0.74%, inclusive, add $2 per ton and each additional 0.25%, add $1 per ton.

BLAST FURNACE SILVERY PIG IRON, Gross Ton

(Base 6.00-6.50% silicon; add $1.25 for each 0.5% Si; 75 cents for each 0.50% Mn over 1%)

Jackson,O. G2, J1	69.00
Buffalo H1	70.25

ELECTRIC FURNACE SILVERY IRON, Gross Ton

(Base 14.01-14.50% silicon; add $1 for each 0.5% Si to 18%; $1 for each 0.50% Mn over 1%; $2 per gross ton premium for 0.045% max P)

NiagaraFalls,N.Y. P15	$92.50
Keokuk,Iowa, Open-hearth & Fdry, freight allowed K2)	97.00
Keokuk, O. H. & Fdry, 12½ lb piglets, 16% Si, frgt allowed K2	100.00

LOW PHOSPHORUS PIG IRON, Gross Ton

Lyles,Tenn. T3 (Phos. 0.035% max)	$72.50
Rockwood,Tenn. T3 (Phos. 0.035% max)	72.50
Steelton Pa. B2 (Phos. 0.035% max)	68.00
Philadelphia, deld.	*71.55*
Troy,N.Y. R2 Phos. 0.035% max)	68.00
Cleveland A7 (Intermediate) (Phos. 0.036-0.075% max)	65.00
Duluth I-3 (Intermediate) (Phos. 0.036-0.075% max)	65.00
Erie,Pa. I-3 (Intermediate) (Phos. 0.036-0.075% max)	65.00
NevilleIsland,Pa. P6 (Intermediate) (Phos. 0.036-0.075% max)	65.00

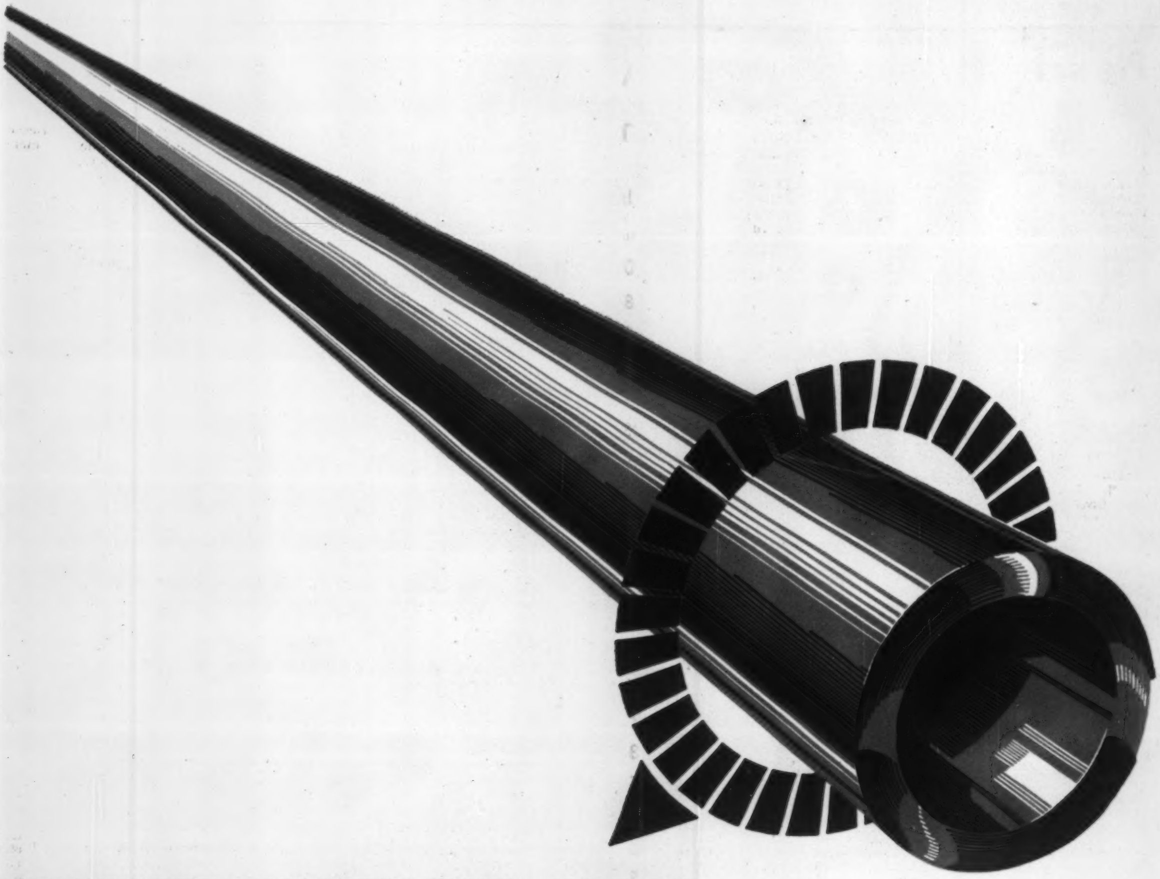
Warehouse Steel Products

Representative prices, per pound, subject to extras, f.o.b. warehouse. City delivery charges are 15 cents per 100 lb except: St. Paul, 25 cents; Moline, Norfolk, Richmond, Washington, 20 cents; Baltimore, Boston, Los Angeles, New York, Philadelphia, Portland, San Francisco, 10 cents; Atlanta, Houston, Seattle, Spokane, no charge.

	SHEETS				STRIP	BARS				Standard	PLATES	
	Hot-Rolled	Cold-Rolled	Gal. 10 Ga.†	Stainless Type 302	Hot-Rolled*	H.R. Merchant Qual.	H.R. Spec. Qual.	C.F. Rds.‡	H.R. Alloy 4140††^{5}	Structural Shapes	Carbon	Floor
Atlanta	7.14	8.20	8.87	....	7.40	7.42	...	9.39	....	7.63	7.49	9.48
Baltimore	7.24	8.35	8.50	....	7.70	7.70	...	8.49^{8}	14.39	7.94	7.56	9.02
Birmingham	7.13	8.24	8.85	....	7.21	7.27	7.80	9.35	....	7.43	7.45	9.50
Boston	8.12	9.07	10.32	53.32	8.21	8.21	8.76	9.73	13.56	8.27	8.41	9.84
Buffalo	7.20	8.25	10.01	....	7.35	7.35	8.05	7.90	13.35	7.60	7.65	9.00
Chattanooga	7.28	8.44	8.60	....	7.36	7.42	7.95	9.18	....	7.63	7.60	9.32
Chicago	7.13	8.24	9.10	46.75	7.21	7.27	7.80	7.75	13.05	7.43	7.45	8.72
Cincinnati	7.25	8.23	9.10	46.10	7.45	7.51	8.04	8.15	13.29	7.90	7.74	8.97
Cleveland	7.13	8.24	8.95	49.16	7.31	7.33	7.86	8.00	13.11	7.76	7.62	8.89
Detroit	7.32	8.43	9.38	43.50	7.49	7.55	8.08	8.04	13.25	7.90	7.73	8.91
Erie, Pa.	7.08	8.24	8.95^{10}	....	7.31	7.35	...	8.10^{10}	....	7.65	7.30	8.79
Houston	7.85	8.75	10.49	....	8.15	8.25	...	9.85	14.00	8.20	7.80	9.20
Jackson, Miss.	7.46	8.52	9.22	....	7.44	7.59	8.12	9.44	....	7.75	7.77	9.44
Los Angeles	8.15	10.00	11.00	51.50	8.50	8.15	8.70	10.90	14.35	8.30	8.75	10.85
Milwaukee	7.22	8.33	9.19	....	7.30	7.36	7.89	7.94	13.14	7.60	7.54	8.81
Moline, Ill.	7.15	8.44	8.85	....	7.41	7.43	...	8.10	....	7.63	7.34	...
New York	7.78	8.88	9.63	53.13	8.23	8.16	8.71	9.77	13.47	8.11	8.21	9.50
Norfolk, Va.	7.35	...	...	....	7.80	7.85	...	9.95	....	8.10	7.60	9.10
Philadelphia	7.34	8.44	9.41	45.98	7.99	7.73	8.26	8.52	13.25	7.75	7.72	8.83**
Pittsburgh	7.13	8.24	9.40	49.00	7.21	7.27	7.80	8.00	13.05	7.43	7.45	8.72
Portland, Oreg.	7.80	8.80	10.65	....	8.00	7.95	...	12.20	15.00	7.85	7.75	9.60
Richmond, Va.	7.25	...	9.49	....	7.85	7.85	...	9.50	....	8.10	7.50	9.35
St. Louis	7.42	8.53	9.69	43.89	7.50	7.56	8.09	8.29	13.34	7.83	7.74	9.01
St. Paul	7.46	8.59	9.16	....	7.72	7.74	...	8.51	13.51	7.94	7.65	9.12
San Francisco	8.20	9.65	10.15	51.65	8.35	8.15	8.70	11.45	14.35^{3}	8.25	8.30	10.50
Seattle	7.85	10.50	10.90	54.00	8.90	8.60	9.15	12.25	14.65	8.50	8.50	10.70
Spokane	8.75	11.10^{7}	10.90	....	8.90	8.60	9.15	12.25	15.40	8.50	8.50	11.20
Washington	7.78	9.80	8.60	....	8.49	8.24	...	9.40	....	8.51	8.11	9.56

*Prices do not include gage extras; †prices include gage and coating extras (based on 13.50-cent zinc), except in Birmingham (coating extra excluded); ‡includes 35-cent special bar quality extras; **⅛-in. and heavier; ††as annealed; §§under ½-in.

Base quantities, 2000 to 4999 lb except as noted; Cold-rolled strip and cold-finished bars, 2000 lb and over except in Seattle, 2000 to 9999 lb, and in Los Angeles, 6000 lb and over; stainless sheets, 8000 lb except in Chicago, New York and Boston, 10,000 lb, and in San Francisco, 2000 to 4999 lb; hot-rolled products on West Coast, 2000 to 9999 lb; ^{2}—500 to 9999 lb; ^{3}—400 to 999 lb; ^{4}—4000 lb and over; ^{5}—1000 to 1999 lb; ^{6}—1000 lb and over; ^{7}—1500 to 3999 lb; ^{8}—2000 to 3999 lb; ^{9}—f.o.b. local delivery in lots of 10,000 lb and over; ^{10}—2000 lb and over



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ASARCO

COLUMBIUM, TANTALUM:
U. S. Depends on Foreign Sources

(1955 Mineral Imports in Pounds)

	Columbium	Tantalum
Argentina	10,800	6,614
Australia	61,586	46,074
Belgian Congo	1,247,901	539,214
Brazil	233,012	221,834
British East Africa	24,399	8,507
British Guiana	7,033	......
British Malaya	515,688	5,853
British West Africa	14,521	......
Federation of Rhodesia & Nyasaland	13,529	18,326
French Equatorial Africa	4,700	......
French Guiana	......	23,085
Madagascar	36,412	10,693
Mozambique	64,974	57,184
Nigeria	5,735,376	303,692
Norway	562,759	11,729
Portugal	168,362	6,614
Spain	2,525	11,276
Union of South Africa	55,539	14,428
United Kingdom	......	28,533
West Germany	849,310	604,030
Total	9,608,426	1,917,686

Source: U.S. Department of Commerce

Have Nots Become Plentiful

Almost overnight, the supply of columbium and tantalum bulks larger than demand. Reason: No more stockpiling. Researchers are taking renewed interest in the metals

COLUMBIUM AND TANTALUM, two of the most restricted minerals for the last several years, now appear to be in sufficient supply. But a new problem is posed: Applications must be developed to prevent the metals from becoming a glut on the market.

What Happened?—Tight government restrictions during recent years helped kill interest in the use of columbium and tantalum as stabilizing agents or base metals. "Now," says one industry observer, "there is less than half as much columbium being used as there was ten years ago." It is estimated that only 400,000 to 500,000 lb were consumed in 1955.

Problems—Prospective users seem to be waiting for someone to guarantee a North American source of supply. The U. S. is a "have not" country. We imported about 99 per cent of our supply last year (see table). A Canadian source may be developed soon.

In a joint venture, Molybdenum Corp. of America and Kennecott Copper Corp. are conducting exploratory drillings in the Oka ore range near Montreal. Molybdenum Corp. officials report that there are sufficient columbium-tantalum ores to meet the maximum industrial requirements for many years to come. But, warns Kennecott's annual report: The ore is complex in character, and development of a process for recovering columbium is difficult.

Columbium has found its greatest use in type 347 stainless steel (up to 1 per cent). It prevents intergranular corrosion and physical impairment at temperatures from 800 to 1600°F. A minimum columbium-carbon ratio of 10 to 1 is required for best results under the most severe temperature conditions.

Combined—During critical supply years, Electro Metallurgical Co., division of Union Carbide & Carbon Corp., turned to a combined ferrotantalum-columbium mix (40-per-cent columbium, 20-per-cent tantalum) to help stretch the critical supplies of columbium. As both are beneficiated from similar ores and provide comparable qualities, 347 stainless production generally calls for the use of ferrotantalum-columbium. Shieldalloy Corp. and Electromet produce ferrocolumbium (5 per cent or less of tantalum) for type 348 stainless and type 347 stainless when the tantalum content must be kept low. Ferrocolumbium sells for about $6.95 a pound; ferrotantalum-columbium, $4.65 to $4.86 a pound.

Columbium is being used as a stabilizing agent in stainless steel castings and flux coated electrodes for arc welding. Kennametal Inc. is using it in the production of carbide tools. Its research department is working on numerous applications which will use columbium as an alloy to help bring about better oxidation resistance in high temperature components, such as scarfing tools and rod mill guides.

As Metals—Columbium, depending on purity, costs from $100 to $150 a pound. Tantalum's price tag is just about half as much. Fansteel Metallurgical Corp. is leading the parade in the fabrication of tantalum capacitors. They can be made from tantalum foil, a wire-type process, or through the use of powdered tantalum. The U. S. Signal Corps purchases tantalum capacitors for air-borne and electronic equipment subject to severe temperature changes.

One of the biggest markets for metallic tantalum is in acid-resisting equipment for the chemical industry. Another is in electronic tubes. Even though transistors are cutting into this market, the use of tantalum for this application is still increasing.

Fansteel says these uses have re-

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sulted in greater production of metallic tantalum now than at the peak of World War II. The company is booked about four months ahead for tantalum and columbium products.

Cautious Optimism—Fansteel and the government are doing research on the use of columbium in nuclear reactors. The company is "cautiously optimistic" about the potential of the classified project. Researchers also are working on the use of columbium in aircraft and guided missiles.

Another development expected to boost the use of both metals is a perfected technique for forming ingots by arc melting. The process produces metal with properties equivalent to that produced by powder metallurgy. The arc melting process is also more economical than former methods.

The outlook for metallic columbium and tantalum is so good that Fansteel has announced two expansion programs this year. Its annual report cited an initial program costing about $1 million. This month, the company said that it plans to build another, much larger plant to produce the materials because earlier plans already appear inadequate.

Government's Role—It appears the U. S. research facilities have many other uses on the docket. It is simply a matter of: Can Canada produce enough to meet expanded needs? A bill in Congress would subsidize domestic miners interested in beneficiating columbium and tantalum ores to about the same extent as the U. S. paid for stockpile ores. These ores sell for as low as $1.35 a pound of contained pentoxides.

There is a growing feeling that as research departments turn to the use of columbium and tantalum in all its forms, better superalloys and high temperature metals will result. "Who knows," says one metallurgist, "we may find that by adding columbium and tantalum, our chrome and nickel base superalloys can be improved."

Canada holds the key to assured domestic supplies. Industrial research facilities hold the key to better exploitation.

Sheets, Strip . . .

Sheet & Strip Prices, Pages 135 & 136

Automotive part suppliers in New England are placing initial orders (flat-rolled steel) for 1957 cars. Shipment date: June. The first specifications are mostly for newly designed and shaped products. This volume business is stimulated by one of the Big Three automobile builders who advised suppliers to cover their steel needs against contracts for accessories now being placed in rising volume. In a few cases, canceled steel orders for May for 1956 parts are being reinstated by stampers.

Although automotive requirements so far this year are off and household appliance needs are not quite up to last year's pace, there still is more than enough demand to absorb all of the hot and cold-rolled sheet tonnage produced this quarter. Even some of the automotive people, who had cut back earlier in the year, are trying to reinstate orders for shipment before the end of this quarter, probably some of the tonnage as a hedge against possible steel labor trouble at midyear and higher prices after the labor issue has been settled.

Some mills have opened books for third quarter orders, but leading sellers still face more inquiry for second quarter than they can promptly handle. Even though demand pressure is not quite so strong as it was a few months back, consumers are still taking all the tonnage offered and in some cases seek more.

At Chicago, the sheetmakers are convinced that inventory-building motives of consumers are keeping demand for cold-rolled and hot-rolled sheets solid. Some easing in demand for cold-rolled is regarded as inevit-

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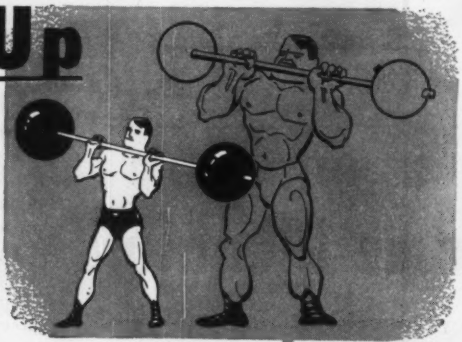

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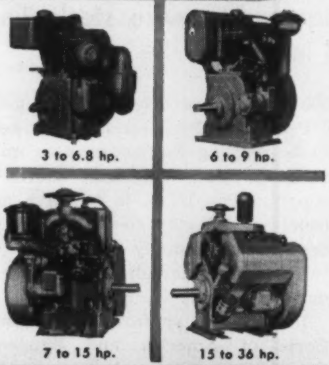

3 to 6.8 hp.
6 to 9 hp.
7 to 15 hp.
15 to 36 hp.

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Ores

Lake Superior Iron Ore

(Prices effective for the 1956 shipping season, gross ton, 51.50% iron natural, rail of vessel, lower lake ports)

Old range bessemer	$11.25
Old range nonbessemer	11.10
Mesabi bessemer	11.00
Mesabi nonbessemer	10.85
Open-hearth lump	12.10
High phos.	10.85

The foregoing prices are based on upper lake rail freight rates, lake vessel freight rates, handling and unloading charges, and taxes thereon, which were in effect Dec. 1, 1955, and increases or decreases after such date are for seller's account.

Eastern Local Iron Ore

Cents per unit, deld. E. Pa.

Foundry and basic 52-62% concentrates contract	17.00-18.00

Foreign Iron Ore

Cents per unit, c.i.f. Atlantic ports

Swedish basic, 60-68%	20.00
N. African hematite (spot)...nom.	18.00-20.00

Brazilian iron ore, 68-69% 13.00c, f.o.b. Victoria.

Tungsten Ore

Net ton unit, before duty

Foreign, wolframite, good commercial quality	*$33.00-$35.50*
Domestic, scheelite, mine	63.00

Manganese Ore

Mn 48%, delivery within six months, $1.15 nom. per long ton unit, c.i.f. U. S. ports, duty for buyer's account; 46-47%, $1.05 nom.

Chrome Ore

Gross ton, f.o.b. cars New York, Philadelphia, Baltimore, Charleston, S. C., plus ocean freight differential for delivery to Portland, Oreg., Tacoma, Wash.

Indian and African

48% 2.8:1	nom. $45.00-$50.00
48% 3:1	42.00-44.00
48% no ratio	34.00

South African Transvaal

44% no ratio	$19.00-$20.00
48% no ratio	33.00-35.00

Domestic

Rail nearest seller

18% 3:1	$39.00

Molybdenum

Sulphide concentrate, per lb of mo content, mines, unpacked	$1.10

Antimony Ore

Per unit of Sb content, c.i.f. seaboard

55-60%	$3.60-$3.85
60-65%	3.85-4.00

Vanadium Ore

Cents per lb V_2O_5 content, deld. mills

Domestic	31.00

Refractories

Fire Clay Brick (per 1000)

High-Heat Duty: Ashland, Grahn, Hayward, Hitchins, Haldeman, Olive Hill, Ky., Athens, Troup, Tex., Beech Creek, Clearfield, Curwensville, Lock Haven, Lumber, Orviston, West Decatur, Pa., Bessemer, Ala., Farber, Mexico, St. Louis, Vandalia, Mo., Ironton, Oak Hill, Parral, Portsmouth, O., Ottawa, Ill., Stevens Pottery, Ga., $122; Salina, Pa., $127; Niles, O., $133.

Super-Duty: Ironton, O., Vandalia, Mo., Olive Hill, Ky., Clearfield, Pa., New Savage, Md., St. Louis, $150.

Silica Brick (per 1000)

Standard: Alexandria, Claysburg, Mt. Union, Sproul, Pa., Ensley, Ala., Windham, Portsmouth, O., Hawstone, Pa., $128; Warren, Niles, O., Hays, Pa., $133; Morrisville, Pa., $131.50; E. Chicago, Ind., Joliet, Rockdale, Ill., $138; Lehigh, Utah, $144; Los Angeles, $151.

Super Duty: Hays, Sproul, Hawstone, Pa., Warren, Windham, O., Leslie, Md., Athens, Tex., $145; Morrisville, Pa., Niles, O., $148; Joliet, Ill., $151; Curtner, Calif., $163.

Semisilica Brick (per 1000)

Clearfield, Pa., $139; Philadelphia, $124; Woodbridge, N. J., $122.

Ladle Brick (per 1000)

Dry Pressed: Alsey, Ill., Chester, New Cumberland, W. Va., Freeport, Johnstown, Merrill Station, Pa., Mexico, Vandalia, Mo., $88.50; Wellsville, O., $92.50; Clearfield, Pa., Portsmouth, O., $98.

High-Alumina Brick (per 1000)

50 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $194; Danville, Ill., $197; Philadelphia, Clearfield, Pa., $201.

60 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $241; Danville, Ill., $244; Philadelphia, Clearfield, Pa., $248.

70 *Per Cent:* St. Louis, Mexico, Vandalia, Mo., $279; Danville, Ill., $281; Clearfield, Pa., Philadelphia, $286.

Sleeves (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., $157; Clearfield, Pa., $158.50; St. Louis, $169.30.

Nozzles (per 1000)

Reesdale, Pa., $253.70; Johnstown, Pa., $259.20; Clearfield, Pa., $259.40; St. Louis, $259.45; Bridgeburg, Pa., $258.

Runners (per 1000)

Reesdale, Johnstown, Bridgeburg, Pa., $196; Clearfield, Pa., $198; St. Louis, $195.80.

Dolomite (per net ton)

Domestic, dead-burned, bulk, Billmeyer, Blue Bell, Williams, Plymouth Meeting, York, Pa., Millville, W. Va., **Bettsville, Millersville**, Martin, Woodville, O., Gibsonburg, Narlo, O., $15; Thornton, McCook, Ill., $15.60; Dolly Siding, Bonne Terre, Mo., $14.

Magnesite (per net ton)

Domestic, dead-burned, bulk, ½-in. grains with fines: Chewelah, Wash., $40; Luning, Nev., $40. ⅝-in. grains with fines: Baltimore, $66.40.

Metallurgical Coke

Price per net ton

Beehive Ovens

Connellsville, furnace	$13.75-14.50
Connellsville, foundry	16.00-17.00

Oven Foundry Coke

Birmingham, ovens	$25.65
Cincinnati, deld.	30.58
Buffalo, ovens	27.50
Buffalo, deld.	28.75
Camden, N. J., ovens	26.50
Chicago, ovens	27.00
Chicago, deld.	28.50
Detroit, ovens	27.50
Detroit, deld.	28.50
Pontiac, deld.	29.06
Saginaw, deld.	30.58
Erie, Pa., ovens	27.50
Everett, Mass., ovens	
New England, deld.	*28.55
Indianapolis, ovens	26.75
Ironton, O., ovens	26.00
Cincinnati, deld.	28.59
Kearny, N. J., ovens	26.75
Lone Star, Tex., ovens	19.50
Milwaukee, ovens	27.50
Neville Island, (Pittsburgh) Pa., ovens	26.25
Painesville, O., ovens	27.50
Cleveland, deld.	29.43
Philadelphia, ovens	26.50
St. Louis, ovens	28.50
St. Paul, ovens	26.50
Swedeland, Pa..., ovens	26.50
Terre Haute, Ind., ovens	26.75

*Or within $4.55 freight zone from works.

Coal Chemicals

Spot, cents per gallon, ovens

Pure benzene	36.00
Toluene, one deg.	32.00-34.00
Industrial xylene	32.00-35.00

Per ton, bulk, ovens

Ammonium sulphate	$42-$45
Birmingham area	42.00†

†With port equalization against imports.

Cents per pound, producing point

Phenol: Grade 1, 15.00; Grade 2-3, 14.50; Grade 4, 16.50; Grade 5, 15.25.

Fluorspar

Metallurgical grades, f.o.b. shipping point, in Ill., Ky., net tons, carloads, effective CaF_2 content 72.5%, $38-$39; 70%, $35-$36; 60%, $31-$32. Imported, net tons, f.o.b. cars point of entry, duty paid, metallurgical grade: European, $34; Mexican, $26.50.

Electrodes

Threaded with nipple, unboxed, f.o.b. plant

Inches		
Diam	Length	Per 100 lb
	GRAPHITE	
2	24	$52.50
2½	30	33.75
3	40	32.00
4	40	30.25
5½	40	30.00
6	60	27.25
7	60	26.75
8, 9, 10	60	24.25
12	72	27.25
14	60	23.50
16	72	22.50
17	60	23.00
18	72	22.50
20	72	22.25
	CARBON	
8	60	12.10
10	60	11.80
12	60	11.75
14	60	11.70
14	72	10.85
17	60	10.75
17	72	10.35
20	84	10.30
20	90	10.10
24	72, 84	10.30
24	96	10.05
30	84	10.20
40, 35	110	9.90
40	100	9.90

able, although this may not be felt until third quarter after the steel wage negotiations. Currently, area mills are getting calls for additional steel. They are fully committed and unable to squeeze in additional tonnage.

While galvanized sheet supply appears adequate at present, requirements are growing due to seasonal gains in farm and construction applications. Enameling stock and electrical sheets continue in tight supply.

Iron Ore . . .

Iron Ore Prices, Page 144

First ore cargoes of the 1956 lake navigation season have been received at lower lake ports. The Lake Superior Iron Ore Association reports shipments from the upper lakes totaled 53,729 in the week ended Apr. 9. This compares with only 10,103 tons in the like week a year ago.

Kaiser Steel Corp. shipped 243,000 tons of iron ore in March to its Fontana, Calif., plant, breaking the previous record by 8 per cent. The ore came from the company's Eagle Mountain mine.

Metallurgical Coke . . .

Metallurgical Coke Prices, Page 144

While metallurgical coke prices were advanced $1 per ton early this month, it appears that oven foundry coke prices will hold unchanged at least until after the steel labor contracts have been negotiated at midyear.

Plates . . .

Plate Prices, 134

One eastern platemaker has opened books for the third quarter, the first producer of this product to take such action. It is accepting orders for the entire period. In contrast, another eastern mill hasn't opened its books for June tonnage.

Consumers have been urging mills to accept third quarter orders, but until the action by this eastern mill last week, it didn't look as though any mill would be in a hurry to book for the period. An exception: Certain defense-rated requirements have been getting preference treatment right along.

Regardless of what action most mills take on the third quarter, all are confident they will have enough business on their books to keep them fully occupied through the period: Indications are there will be some arrearages at the end of the current quarter.

With emphasis on capital requirements, producers expect the pressure on plates to continue throughout the year. Heavy industrial equipment, building construction, railroad equipment, tanks and line pipe work, as well as increasing ship work, feature current demand. Some tank fabricators have the heaviest order backlogs in their history.

Lukens Steel Co. has just turned out what is said to be the heaviest stainless steel plates ever rolled. To be processed for the Navy by Combustion Engineering Inc., the finished plates are 3½-in. thick, 168 by 144 in., and weigh about 25,000 lb each. They were rolled on the company's 206-in. mill from ingots which weighed nearly 25 tons each and were about 1-yd thick. They will be fabricated at Chattanooga, Tenn.

Reinforcing Bars . . .

Reinforcing Bar Prices, Page 134

Reinforced concrete construction is about to get another boost in the Midwest because deliveries of fabricated structural steel have become so extended. The Illinois Toll Highway Commission is preparing to build a prefabricated overpass bridge as an experiment. If successful, it could be duplicated on about 200 overpass bridges over parts of the projected 193 miles of toll roads in northern Illinois. The experimental bridge will cost $125,000, against $150,000 for a conventional structural steel bridge. Building will take one-fourth less time.

Steel Bars . . .

Bar Prices, Page 134

Demand for carbon steel bars (hot rolled) is less urgent than it was some time ago: producers anticipate capacity operations through the current quarter. They are not too concerned about the third quarter. While they anticipate a leveling off in buying during the period, possibly a decline, they expect to be moderately busy despite seasonal influences and current inventory building inspired by the possibility of a strike.

Consumption is off in the Chicago area, with the automotive and farm implement industries operating at lower rates than at the start of the year. Still, barmakers detect only slightly less demand. They think that inventory building may be figuring in activities this quarter. Some mills are oversold and will maintain capacity operations until midyear at least. Cold finishers, now able to get hot-rolled bars more freely, find demand for their product not so pressing as it has been.

Eastern bar mills say they will have enough tonnage on their books to keep them fully occupied this quarter. They anticipate good third quarter bookings. The market, however, is not under the pressure it was earlier in the year. Hot alloy bars are still available for second quarter shipment, provided there is not too much extra processing involved. Cold drawers would like to obtain more hot stock, but they appear not too badly pressed by demand for their product. Tool steel bars are in adequate supply.

Some inventory accumulation is noted in hot-rolled bars at Pittsburgh.

Producers have not opened third quarter books for hot alloy bars, but they are willing to accept cold-drawn carbon and alloy bar tonnage and hot alloy business for delivery beyond June.

Tubular Goods . . .

Tubular Goods Prices, Page 138

Buttweld pipe is in relatively easy supply, but the pipe mills are booked up through the second quarter on lapweld pipe and well beyond that on seamless.

Demand for oil country tubular goods is reported particularly strong, and backlogs of most oil field items are said to be substantially larger than they were a year ago.

Sales of National Supply Co. in the first quarter of this year are running more than 15 per cent ahead of the same period a year ago, re-

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ports Arthur W. McKinney, president.

Producers of mechanical tubing report strong growth trends in automatic transmissions and hydraulic cylinders for construction equipment. During the last half of this year, pressure tubemakers expect heavy demand will accompany expansion in power facilities. Most specialty tube mills have full order books.

Steel Still Setting Records

All-time records in steel output were set during March and the first quarter of 1956, reports the American Iron & Steel Institute. March production of 10,921,000 net tons compared with the previous monthly high of 10,828,231 tons in January. Last month was the sixth in succession in which steel production exceeded 10 million tons.

The March total brought production for the first quarter to 31,868,226 tons, exceeding by more than 616,000 tons the previous quarterly peak of 31,251,967 tons set in the closing quarter of last year.

The Institute's preliminary report shows that steelmaking furnaces in March averaged 100.2 per cent of the Jan. 1, 1956, capacity rating of 128,363,090 tons annually. It was the first time the monthly rate had been above 100 per cent since May, 1953. The rate for the first quarter was 99.6 per cent at that time.

The index of production (1947-49 equals 100) was 153.5 in March, compared with 152.1 in February and 140.3 in March a year ago. The index for the first quarter this year was 152.6, compared with 148 during the last quarter of 1955 and 132.3 for the first quarter of last year.

Comparative production data follow:

Tool Steel . . .

Tool Steel Prices, Page 138

Shipments of high speed and tool steel (excluding hollow drill steel) totaled 10,613 net tons in February, reports the American Iron & Steel Institute. This was slightly down from the 11,113 tons shipped in January but was up sharply from the 7902 tons moved in February a year ago.

Cumulative shipments to the end of February this year were 21,726 tons, an increase compared with the 15,724 tons shipped in the like two months of 1955.

Tin Plate . . .

Tin Plate Prices, Page 136

Shipments of metal cans totaled 296,547 tons in February, compared with 290,032 tons in January and 260,514 in February a year ago. The cumulative total for the first two months of 586,579 tons compared with 540,065 tons in the corresponding period of 1955.

Movement of vegetable cans during the first two months was 136,954 tons, against 127,779 in the first two months of 1955. Shipment of beer cans (second largest category) totaled 88,226 tons against 78,831.

Consumers are seeking to stock as much tin plate as possible before prices rise at the end of this month. Tin mill sales managers predict sales for late second quarter and third quarter will be heavy despite the forward ordering in evidence.

U. S. Steel Corp. is installing another electrolytic tin line at its Columbia-Geneva Steel Division plant in Pittsburg, Calif. This will boost the plant's annual capacity to an estimated 440,000 tons. Completion is scheduled for late 1957.

In addition to the tinning line, the project includes related production facilities and the conversion of two hot dip tinning lines to reclassification equipment. This will result in a reduction in hot dip capacity.

Structural Shapes . . .

Structural Shape Prices, Page 134

Builders' and fabricators' problems are mounting, with structural steel deliveries running well into next year. Builders are finding it necessary to defer construction plans because of the short steel supply.

Of immediate concern to builders and fabricators, is the scarcity of structurals, especially wide flange sections. Not only does supply fall well short of demand, but the mills are falling behind on their commitments. This is disrupting schedules at fabricating shops and is delaying work on various projects already under way.

Many jobs, particularly in the small category, are being switched to reinforced concrete construction. Where the switch isn't complete, specifications for reinforced concrete are being added to original plans as an alternate in many cases.

Completion dates are being extended up to one year on new Connecticut bridge tonnage. Owing to the structural shortage and 12-to-14-month delivery on fabricated steel, the Hartford-East Hartford State street bridge superstructure, will specify completion in two years. Original plans: Ten months to one year. The project comes out for estimates this month.

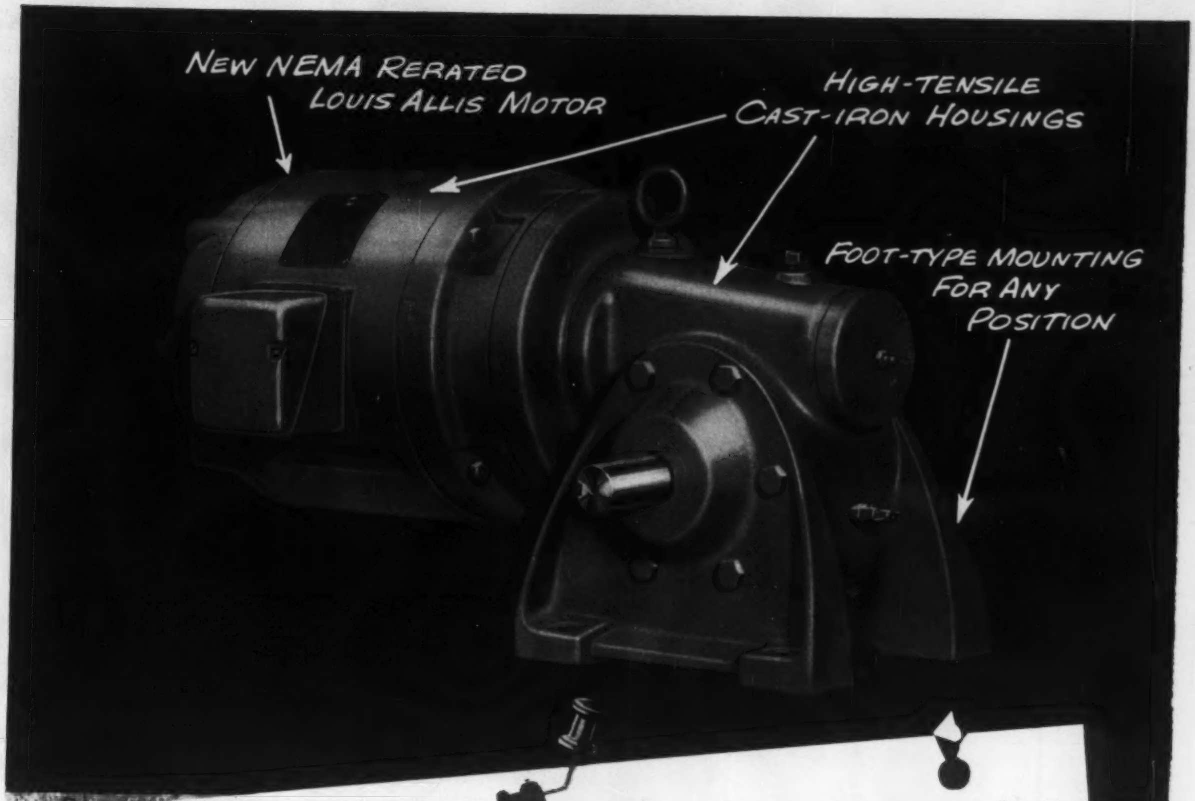
Bethlehem Steel Co. is fabricating

	OPEN HEARTH			BESSEMER			ELECTRIC			TOTAL			Calculated weekly production (Net tons)
Period	Net tons	Per cent of capacity	‡Index	Net tons	Per cent of capacity	‡Index	Net tons	Per cent of capacity	‡Index	Net tons	Per cent of capacity	‡Index	
1956													
January	9,676,151	101.4	151.1	323,235	79.5	92.0	828,845	86.6	232.1	10,828,231	99.3	152.2	2,444,296
*February	9,043,064	101.3	150.9	296,543	78.0	90.2	779,388	87.1	233.3	10,118,995	99.2	152.1	2,444,202
†March	9,778,000	102.5	152.7	310,000	76.2	88.2	833,000	87.1	233.2	10,921,000	100.2	153.5	2,465,000
†1st Quarter	28,497,215	101.8	151.6	929,778	77.9	90.1	2,441,233	87.0	232.8	31,868,226	99.6	152.6	2,451,402
1955													
January	8,054,345	86.0	125.7	199,229	49.0	56.7	584,162	63.6	163.6	8,837,736	82.7	124.2	1,994,974
February	7,734,884	91.5	133.7	197,091	53.7	62.1	564,959	68.1	175.1	8,496,934	88.0	132.2	2,124,233
March	9,060,026	96.7	141.4	255,493	62.8	72.7	666,235	72.6	186.5	9,981,754	93.4	140.3	2,253,281
1st Quarter	24,849,255	91.4	133.6	651,813	55.2	63.9	1,815,356	68.1	175.1	27,316,424	88.0	132.3	2,124,139
April	8,858,549	97.7	142.9	275,069	69.8	80.9	681,477	76.6	197.2	9,815,095	94.8	142.6	2,287,901
May	9,307,291	99.4	145.3	305,347	75.1	86.9	715,678	77.9	200.4	10,328,316	96.6	145.2	2,331,448
June	8,764,430	96.6	141.4	283,544	72.0	83.4	698,493	78.6	202.1	9,746,467	94.1	141.6	2,271,904
2nd Quarter	26,930,270	97.9	143.2	863,960	72.3	83.8	2,095,648	77.7	199.9	29,889,878	95.2	143.1	2,297,454
1st 6 Months	51,779,525	94.7	138.5	1,515,773	63.8	73.9	3,911,004	72.9	187.5	57,206,302	91.6	137.7	2,211,299
July	8,232,535	88.1	128.5	268,348	66.1	76.4	600,063	65.5	168.0	9,100,946	85.3	127.9	2,059,038
August	8,600,612	91.8	134.3	298,972	73.5	85.1	694,000	75.7	194.6	9,594,545	89.7	134.9	2,165,812
September	8,829,266	97.6	142.4	307,171	78.2	90.3	745,888	84.1	215.8	9,882,325	95.7	143.5	2,308,954
3rd Quarter	25,662,413	92.4	135.0	874,491	72.6	83.9	2,040,912	75.0	192.5	28,577,816	90.2	135.4	2,176,528
9 Months	77,441,938	93.9	137.3	2,390,264	66.8	77.2	5,951,916	73.6	189.2	85,784,118	91.1	136.9	2,199,593
October	9,369,704	100.0	146.3	330,150	81.2	94.0	801,196	87.3	224.3	10,501,050	98.2	147.6	2,370,440
November	9,141,244	100.8	147.5	306,674	77.9	90.2	799,480	89.9	231.3	10,247,398	99.0	148.8	2,388,671
December	9,406,531	100.7	146.9	292,429	72.1	83.2	804,559	87.8	225.3	10,503,519	98.5	147.6	2,376,362
4th Quarter	27,917,479	100.5	146.9	929,253	77.0	89.1	2,405,235	88.3	226.9	31,251,967	98.6	148.0	2,378,384
Last Half	53,579,892	96.5	140.9	1,803,744	74.8	86.5	4,446,147	81.7	209.7	59,829,783	94.4	141.7	2,277,495
Total 1955	105,359,417	95.6	139.7	3,319,517	69.3	80.2	8,357,151	77.3	198.7	117,036,085	93.0	139.7	2,244,651

Note—The percentages of capacity operated are calculated on weekly capacities in 1956 of 2,154,144 net tons open hearth, 91,810 net tons bessemer and 215,939 net tons electric ingots and steel for castings, total 2,461,893 net tons; based on annual capacities as of Jan. 1, 1956, as follows: Open hearth 112,317,040 net tons, bessemer 4,787,000 net tons, electric 11,259,050 net tons, total 128,363,090 net tons.

Note—The percentages of capacity operated are calculated on weekly capacities in 1955 of 2,114,196 net tons open hearth, 91,810 net tons bessemer and 207,272 net tons electric ingots and steel for castings, total 2,413,278 net tons; based on annual capacities as of Jan. 1, 1955, as follows: Open hearth 110,234,160 net tons, bessemer 4,787,000 net tons, electric 10,807,150 net tons, total 125,828,310 net tons.

*Revised. †Preliminary figures, subject to revision. ‡Index of production based on average weekly production of the three years 1947-1948-1949.



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- The output shaft is mounted in tapered roller bearings for maximum load-carrying capacity.
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what is said to be the longest plate girder ever built. It is for the 11,450-ton bridge superstructure, Quinnipiac river, New Haven, Conn. The center span of the three-span, continuous riveted plate girder bridge is 387 ft, with two side spans 258 ft. each. Girders have a maximum depth of 21½ ft over abutments and 12½ ft at center. The center span exceeds by 12 feet the main spans over the Hackensack and Passaic rivers, New Jersey turnpike.

This trend toward more and longer plate girders in bridge construction is contributing to the plate shortage. Structural shops are using more plates than ever before in building up plate girder sections.

Ederer Engineering Co., Seattle, has been awarded a contract to construct a 40-ton and a 15-ton bridge crane for a shop and craneway addition to the plant of the Todd Shipyard Corp., Seattle. The project will cost $590,000. Isaacson Iron Works, Seattle, will fabricate 450 tons of steel for the job.

Wire . . .

Wire Prices, Pages 136 & 137

Demand for manufacturers wire is active, with supplies of wire rods noticeably tight at some points. Merchant wire products are moving a little better seasonally. Business, however, still is reported disappointing to most producers.

Pig Iron . . .

Pig Iron Prices, Page 139

While pig iron buying is less than it was three or four weeks ago when some protective covering was done in anticipation of a price increase around Apr. 1, business is still fairly brisk.

There was not so much protective buying last month as earlier in the year when there was widespread talk of an early price increase. As time went on and no advances developed, buying declined. Not only had stocks been accumulated, but a feeling developed in some quarters that an increase might be put off until steel labor contracts had been settled.

But there was some protective covering in March, and there probably will be more before the end of this quarter. Sellers expect a spurt in protective covering within a few weeks.

Supply of merchant iron is adequate to satisfy current steady demand.

Through June, Mystic Iron Works' prices will be unchanged to contract customers at $62.50, furnace, for No. 2 foundry iron. Rebuilding of the furnace at Everett, Mass., is on schedule and operations are expected to be resumed July 1. Meanwhile, the Mystic stockpile is being reserved for contract customers. Foundry melt in New England is spotty among shops supplying the machine tool and textile equipment industries.

The 27-day strike at Woodward Iron Co., Birmingham, ended Apr. 9 when the company agreed to a change in the seniority clause of its contract with railroad department workers. The plant had been closed after other union employees refused to cross picket lines of the railroad men. Several days were required before full operation of the plant was attained.

In the Buffalo area, mills are using a high precentage of hot metal in their open-hearth departments because of the scarcity of good scrap. This is taking a big percentage of their blast furnace output and leaving relatively little for the merchant trade. As a result, merchant iron producers are able to sell all they turn out at capacity levels. Stockpiling of iron at furnaces is lighter than usual.

The first merchant iron moved out of Buffalo via Great Lakes freighter last week for Detroit, marking the start of what is expected to be a busy iron shipping season. Considerable iron also is moving out of the Buffalo area to eastern districts.

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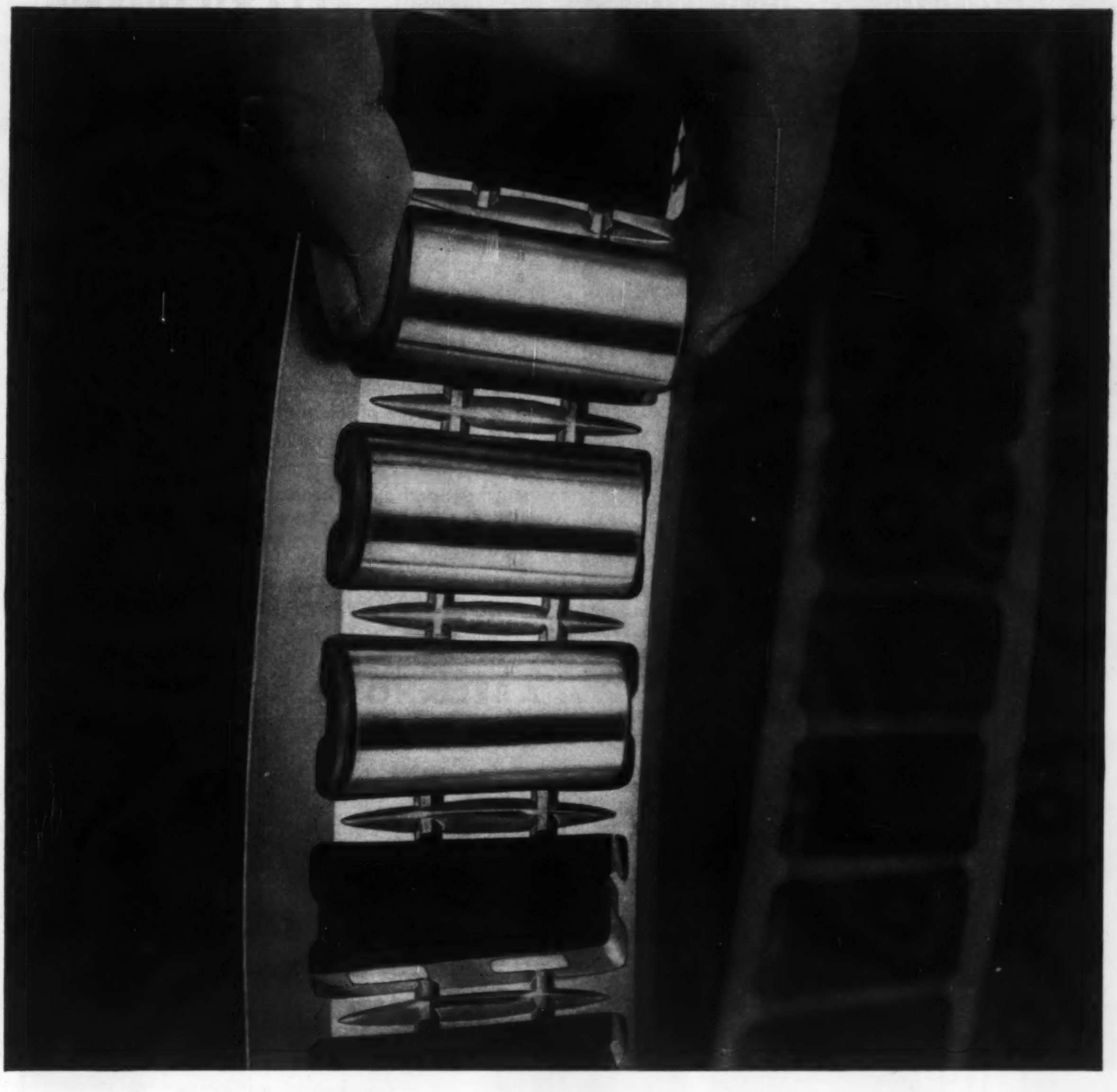

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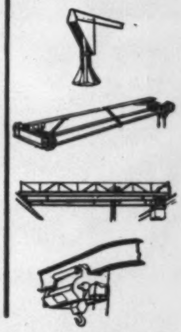

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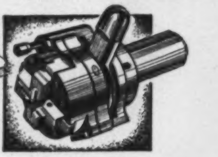

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Scrap . . .

Scrap Prices, Page 152

Philadelphia — Higher prices on open-hearth scrap brought out more material, but apparently not enough. In many cases, brokers are compelled to pay more than their selling prices for scrap. Some small lots have been purchased by consumers at still higher levels, with U. S. Steel at Fairless, Pa., negotiating for additional tonnage.

No. 1 heavy melting steel, No. 1 bundles and No. 1 busheling are holding at $55, delivered; No. 2 heavy melting at $47; and No. 2 bundles at $44.50. All other grades have been advanced. In cast material, heavy breakable is up $1 a ton to $54, delivered.

The increases may be ascribed primarily to domestic interest as relatively little scrap is being collected here for export. Indications point to only one cargo as likely to leave this port this month. Exporters say that foreign buyers are turning more to southern ports, where scrap is more plentiful and less expensive.

Electric furnace bundles have been advanced to $57, delivered; mixed borings and turnings to $37; machine shop turnings to $37; short shoveling turnings to $40; heavy turnings to $51; low phos structurals and plate, $58-$60; couplers, springs and wheels, $61; and rail crops, 2 ft and under, $67.

Pittsburgh—Prices continue their upward movement. Last week purchases of No. 2 heavy melting were reported at $48, and short shovel turnings at $42. An independent mill bought No. 1 heavy melting at $55. Brokers are paying $56 for good grades of No. 1 scrap. Railroad grades are up $1 to $4. Stainless steel scrap and cast iron grades also are higher.

Boston—Steel scrap prices are holding recent gains resulting from new buying for eastern Pennsylvania and Ohio Valley mills. No. 2 grades are slightly higher. As high as $50-$51 has been paid for No. 1 steel, shipping point, in covering against old orders for district delivery. Cast grades, while slightly firmer, are not fully following the rise on steel items.

New York—Demand for the prime grades of open-hearth scrap is exceedingly strong as reflected by the wide margin between the No. 1 and No. 2 grades. For instance, brokers are paying $49-$50 for No. 1 heavy melting steel as against $40-$41 for No. 2 heavy melting. Normally, the spread between these two grades would be $2 or $3.

Offerings for these grades represent an advance over a week ago. No. 1 bundles have been advanced to $49-$50, and No. 2 bundles have been raised to $37-$38. The boring and turning grades are unchanged, but low phos structurals and plate prices have been increased to $50-$51. Cast grades and the stainless steel specialties are steady.

Buffalo—No. 1 heavy melting steel hit $56 in this market when a consumer bought a small lot at that figure. The melter also bought No. 2 heavy melting at $45 and No. 2 bundles at $42. Other grades moved up in sympathy with No. 1 heavy melting, including low phos at $57, No. 1 bundles at $56 and railroad specialties at $60.

Some brokers insist the $56 price is not representative of the market since it applied only on limited tonnage. But they are having difficulty covering old orders placed at $53. Quality scrap is scarce.

Cleveland—Prices on quality grades of steelmaking scrap continue to rise here, although new buying is restricted. With No. 1 heavy melting quoted $57-$58 here and $58-$59 in the Valley, brokers and dealers think the market is at about the top.

Youngstown—The scrap market here is strong. No. 1 heavy melting is moving at $58 and No. 1 bundles at $57. Dealers are shipping No. 1 grades as fast as such material comes into their yards. No. 2 scrap, however, is in plentiful supply. The New York Central is expected to issue its list of old locomotives shortly.

Cincinnati—Scrap prices have reached a level here which is expected to hold until next month. Railroad lists brought higher prices, No. 1 railroad heavy melting moving up $6 a ton to $60-$61.

Detroit — Scrap prices are up sharply here in response to strong demand and a noticeable shortage of quality material. Steel ingot operations this week are off slightly, due chiefly to a work stoppage at one steelworks.

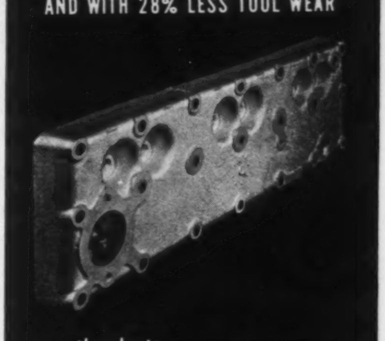
Chicago — Pricewise, the scrap market here appears to have leveled off, although scattered sales of some important items at $1 or $2 higher are reported. Silence and sparse buying on the part of consumers make confirmation of such reports difficult. Consumption of scrap at an all-time level continues, with the district steelmaking rate at 100.5 per cent of capacity. This makes for growing scarcities of high quality, big volume grades.

Washington—Consumption of ferrous materials (pig iron and scrap) in February dropped 6 per cent from the preceding month because of fewer days, but the daily rate of consumption held virtually unchanged, reports the Bureau of Mines.

Total melt was 12,214,000 gross tons, of which 51.9 per cent was scrap and 48.1 per cent pig iron. Scrap consumed for all purposes totaled 6,343,000 gross tons, 5 per cent less than in January. Pig iron consumption in the month was 5,871,000 tons, off 6 per cent from the January total.

Stocks of ferrous scrap held by consumers at the end of February amounted to 6,402,000 gross tons. This was a slight increase over the previous month. Stocks of pig iron

(Please turn to page 154)



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Iron and Steel Scrap

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Apr. 11	$55.00
Apr. 4	54.17
Mar. Avg.	50.21
Apr. 1955	36.73
Apr. 1951	44.00

Based on No. 1 heavy melting grade at Pittsburgh, Chicago and eastern Pennsylvania

---

PITTSBURGH

No. 1 heavy melting	54.00-55.00
No. 2 heavy melting	*47.00-48.00*
No. 1 bundles	54.00-55.00
No. 2 bundles	*45.00-46.00*
No. 1 busheling	54.00-55.00
Machine shop turnings	*38.00-39.00*
Mixed borings, turnings	*38.00-39.00*
Short shovel turnings	*41.00-42.00*
Cast iron borings	*41.00-42.00*
Cut structurals, 3 ft lengths	*62.00-63.00*
Heavy turnings	*47.00-48.00*
Punchings & plate scrap	*62.00-63.00*
Electric furnace bundles	*57.00-58.00*
Cast Iron Grades	
No. 1 cupola	*52.00-53.00*
Charging box cast	*48.00-49.00*
Heavy breakable cast	*48.00-49.00*
Unstripped motor blocks	*35.00-36.00*
No. 1 machinery cast	*57.00-58.00*
Railroad Scrap	
No. 1 R.R. heavy melt.	*62.00-63.00*
Rails, 2 ft and under	*71.00-72.00*
Rails, 18 in. and under	*72.00-73.00*
Rails, random lengths	*66.00-67.00*
Railroad specialties	*65.00-66.00*
Stainless Steel Scrap	
18-8 bundles & solids	*345.00-355.00*
18-8 turnings	*240.00-250.00*
430 bundles & solids	110.00-120.00
430 turnings	60.00-65.00

CLEVELAND

No. 1 heavy melting	*57.00-58.00*
No. 2 heavy melting	*50.00-51.00*
No. 1 bundles	*57.00-58.00*
No. 2 bundles	*44.00-45.00*
No. 1 busheling	*57.00-58.00*
Machine shop turnings	*32.00-33.00*
Mixed borings, turnings	*36.00-37.00*
Short shovel turnings	*36.00-37.00*
Cast iron borings	*36.00-37.00*
Low phos.	59.00-60.00
Cut structural plates 2 ft and under	62.00-63.00
Alloy free, short shovel turnings	37.00-38.00
Electric furnace bundles	*58.00-59.00*
Cast Iron Grades	
No. 1 cupola	*58.50-59.50*
Charging box cast	*50.00-51.00*
Stove plate	*55.00-56.00*
Heavy breakable cast	*49.00-50.00*
Unstripped motor blocks	*34.00-35.00*
Brake shoes	*45.00-46.00*
Clean auto cast	*58.50-59.50*
Burnt cast	*45.00-46.00*
Drop broken machinery	*59.00-60.00*
Railroad Scrap	
No. 1 R.R. heavy melt.	*57.00-58.00*
R.R. malleable	*65.00-66.00*
Rails, 2 ft and under	*74.50-75.50*
Rails, 18 in. and under	*73.00-74.00*
Rails, random lengths	*69.00-70.00*
Cast steel	*62.00-63.00*
Railroad specialties	*62.00-63.00*
Uncut tires	*63.00-64.00*
Angles, splice bars	*68.00-69.00*
Rails, rerolling	*71.00-72.00*
Stainless Steel (Brokers' buying prices; f.o.b. shipping point)	
18-8 bundles, solids	345.00-355.00
18-8 turnings	205.00-215.00
430 clips, bundles, solids	105.00-115.00
430 turnings	55.00-65.00

YOUNGSTOWN

No. 1 heavy melting	58.00-59.00
No. 2 heavy melting	*47.00-48.00*
No. 1 bundles	58.00-59.00
No. 2 bundles	*44.00-45.00*
No. 1 busheling	58.00-59.00
Machine shop turnings	*33.00-34.00*
Short shovel turnings	*37.00-38.00*
Cast iron borings	*37.00-38.00*
Low phos.	59.00-60.00
Electric furnace bundles	59.00-60.00
Railroad Scrap	
No. 1 R.R. heavy melt.	59.00-60.00

CHICAGO

No. 1 heavy melting	53.00-56.00
No. 2 heavy melting	44.00-45.00
No. 1 factory bundles	57.00-58.00
No. 1 dealer bundles	*53.00-54.00*
No. 2 bundles	*41.00-42.00*
No. 1 busheling	53.00-56.00
Machine shop turnings	31.00-32.00
Mixed borings, turnings	33.00-34.00
Short shovel turnings	33.00-34.00
Cast iron borings	33.00-34.00
Cut structurals, 3 ft	57.00-58.00
Punchings & plate scrap	58.00-59.00
Cast Iron Grades	
No. 1 cupola	51.00-52.00
Stove plate	44.00-45.00
Unstripped motor blocks	40.00-41.00
Clean auto cast	55.00-56.00
Drop broken machinery	55.00-56.00
Railroad Scrap	
No. 1 R.R. heavy melt.	57.00-58.00
R.R. malleable	63.00-64.00
Rails, 2 ft and under	71.00-72.00
Rails, 18 in. and under	72.00-73.00
Angles, splice bars	66.00-67.00
Rails, rerolling	72.00-73.00
Stainless Steel Scrap	
18-8 bundles & solids	345.00-360.00
18-8 turnings	250.00-260.00
430 bundles & solids	105.00-110.00
430 turnings	55.00-60.00

DETROIT

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	*55.00*
No. 2 heavy melting	*47.00*
No. 1 bundles	*55.00*
No. 2 bundles	37.00
No. 1 busheling	*55.00*
Machine shop turnings	*24.00*
Mixed borings, turnings	*24.00*
Short shovel turnings	28.00
Punchings & plate scrap	*65.00*
Cast Iron Grades	
No. 1 cupola	*46.00*
Charging box cast	*39.00*
Stove plate	38.00
Heavy breakable	*38.00*
Unstripped motor blocks	*27.00*
Clean auto cast	*52.00*
Malleable	*52.00*

BIRMINGHAM

No. 1 heavy melting	37.00-38.00
No. 2 heavy melting	34.00-35.00
No. 1 bundles	37.00-38.00
No. 2 bundles	29.00-30.00
No. 1 busheling	37.00-38.00
Cast iron borings	*21.50-22.50*
Short shovel turnings	*32.00-33.00*
Machine shop turnings	*31.00-32.00*
Electric furnace bundles	*44.00-45.00*
Cast Iron Grades (F.o.b. shipping point)	
No. 1 cupola	47.50-48.00
Stove plate	44.50-45.50
Bar crops and plate	51.00-52.00
Structural & plate, 2 ft.	49.00-50.00
Unstripped motor blocks	37.00-38.00
Charging box cast	32.00-33.00
No. 1 wheels	*39.00-40.00*
Railroad Scrap	
No. 1 R.R. heavy melt.	*49.00-50.00*
Rails, 18-in. and under	62.00-63.00
Rails, rerolling	*63.00-64.00*
Rails, random lengths	60.00-61.00
Angles, splice bars	58.00-59.00

PHILADELPHIA

No. 1 heavy melting	*56.00*
No. 2 heavy melting	*47.00*
No. 1 bundles	*56.00*
No. 2 bundles	*44.50*
No. 1 busheling	*56.00*
Electric furnace bundles	*57.00*
Mixed borings, turnings	*37.00*
Machine shop turnings	*37.00*
Short shovel turnings	*40.00*
Heavy turnings	*51.00*
Structurals & plates	*58.00-60.00*
Couplers, springs, wheels	*61.00*
Rail crops, 2 ft & under	*67.00*
Cast Iron Grades	
No. 1 cupola	49.00-50.00
Malleable	68.00
Heavy breakable cast	*54.00*
Drop broken machinery	55.00

NEW YORK

(Brokers' buying prices)

No. 1 heavy melting	*49.00-50.00*
No. 2 heavy melting	*40.00-41.00*
No. 1 bundles	*49.00-50.00*
No. 2 bundles	*37.00-38.00*
Machine shop turnings	29.50-30.50
Mixed borings, turnings	31.00-32.00
Short shovel turnings	33.00-33.50
Low phos. (structural & plate)	*50.00-51.00*
Cast Iron Grades	
No. 1 cupola	42.00-43.00
Unstripped motor blocks	31.00-33.00
Heavy breakable	46.00-47.00
Stainless Steel	
18-8 sheets, clips solids	320.00-325.00
18-8 borings, turnings	150.00-160.00
430 sheets, clips, solids	120.00-125.00
410 sheets, clips, solids	100.00-105.00

BOSTON

(Brokers' buying prices; f.o.b. shipping point)

No. 1 heavy melting	*46.00-47.00*
No. 2 heavy melting	*36.00-36.50*
No. 1 bundles	*46.00-47.00*
No. 2 bundles	*34.00-34.50*
No. 1 busheling	*46.00-47.00*
Machine shop turnings	*28.00-28.50*
Mixed borings, turnings	*29.00-29.50*
Short shovel turnings	*31.00-31.50*
No. 1 cast	40.50-41.00
Mixed cupola cast	38.00-39.00
No. 1 machinery cast	42.00-43.00

BUFFALO

No. 1 heavy melting	*55.00-56.00*
No. 2 heavy melting	*44.00-45.00*
No. 1 bundles	*55.00-56.00*
No. 2 bundles	*41.00-42.00*
No. 1 busheling	*55.00-56.00*
Mixed borings, turnings	*31.00-32.00*
Machine shop turnings	*31.00-32.00*
Short shovel turnings	*34.00-35.00*
Cast iron borings	*31.00-32.00*
Low phos.	*56.00-57.00*
Cast Iron Grades (F.o.b. shipping point)	
No. 1 cupola	48.00-49.00
No. 1 machinery	51.00-52.00
Railroad Scrap	
Rails, random lengths	58.00-59.00
Rails, 3 ft and under	64.00-65.00
Railroad specialties	*59.00-60.00*

CINCINNATI

(Broker's buying prices; f.o.b. shipping point)

No. 1 heavy melting	53.00-54.00
No. 2 heavy melting	43.00-44.00
No. 1 bundles	53.00-54.00
No. 2 bundles	*40.00-41.00*
No. 1 busheling	53.00-54.00
Machine shop turnings	33.50-34.50
Mixed borings, turnings	33.50-34.50
Short shovel turnings	35.50-36.50
Cast iron borings	33.50-34.50
Low phos., 18 in.	57.00-58.00
Cast Iron Grades	
No. 1 cupola	48.00-49.00
Heavy breakable cast	45.00-46.00
Charging box cast	45.00-46.00
Drop broken machinery	57.00-58.00
Railroad Scrap	
No. 1 R.R. heavy melt.	*60.00-61.00*
Rails, 18 in. and under	69.00-70.00
Rails, random lengths	61.00-62.00

ST. LOUIS

(Brokers' buying prices)

No. 1 heavy melting	45.00
No. 2 heavy melting	42.50
No. 1 bundles	45.00
No. 2 bundles	38.50
No. 1 busheling	45.00
Machine shop turnings	28.00
Short shovel turnings	29.50
Cast Iron Grades	
No. 1 cupola	*46.00*
Charging box cast	45.00
Heavy breakable cast	43.00
Unstripped motor blocks	43.00
Brake shoes	45.00
Clean auto cast	49.00
Stove plate	*43.00*
Railroad Scrap	
No. 1 R.R. heavy melt.	*56.50*
Rails, 18 in. and under	*71.00*
Rails, random lengths	*67.50*
Rails, rerolling	*71.50*
Angles, splice bars	62.00

SEATTLE

No. 1 heavy melting	39.00
No. 2 heavy melting	33.00-35.00
No. 1 bundles	35.00
No. 2 bundles	26.00
No. 3 bundles	17.00
Machine shop turnings	15.00-16.00
Mixed borings, turnings	15.00-16.00
Short shovel turnings	15.00-16.00
Electric furnace, bundles	52.00-55.00
Cast Iron Grades (F.o.b. shipping point)	
No. 1 cupola	42.00
Heavy breakable cast	33.00
No. 1 wheels	35.00
Unstripped motor blocks	30.00
Clean motor blocks	35.00
Stove plate (f.o.b. plant)	30.00
Brake shoes	30.00
Railroad Scrap	
Rails, random lengths	38.00

LOS ANGELES

No. 1 heavy melting	38.00
No. 2 heavy melting	32.00
No. 1 bundles	37.00
No. 2 bundles	28.00
Machine shop turnings	17.00
Cast Iron Grades (F.o.b. shipping point)	
No. 1 cupola	42.00

SAN FRANCISCO

No. 1 heavy melting	36.00
No. 2 heavy melting	30.00
No. 1 bundles	35.00
No. 2 bundles	26.00
No. 1 busheling	36.00
Machine shop turnings	20.00-23.00
Mixed borings, turnings	20.00-23.00
Cast iron borings	20.00-23.00
Short shovel turnings	25.00
Cut structurals	45.00
Heavy turnings	20.00-23.00
Punchings & plate scrap	44.00
Cast Iron Grades	
No. 1 cupola	45.00
Charging box cast	35.00
Stove plate	39.00
Heavy breakable cast	36.00
Unstripped motor blocks	32.00
Brake shoes	35.00
Clean auto cast	45.00
No. 1 wheels	39.00
Burnt cast	23.00
Drop broken machinery	50.00

HAMILTON, ONT.

No. 1 heavy melting	*50.50*
No. 2 heavy melting	*46.50*
No. 1 bundles	*50.50*
No. 2 bundles	*43.00*
Mixed steel scrap	*44.50*
Mixed borings, turnings	*24.00*
Rails, remelting	*58.50*
Busheling, new factory: Prepared	*48.50*
Busheling, new factory: Unprepared	*44.50*
Short steel turnings	27.50
Cast Iron Grades†	
No. 1 machinery cast	*50.00*

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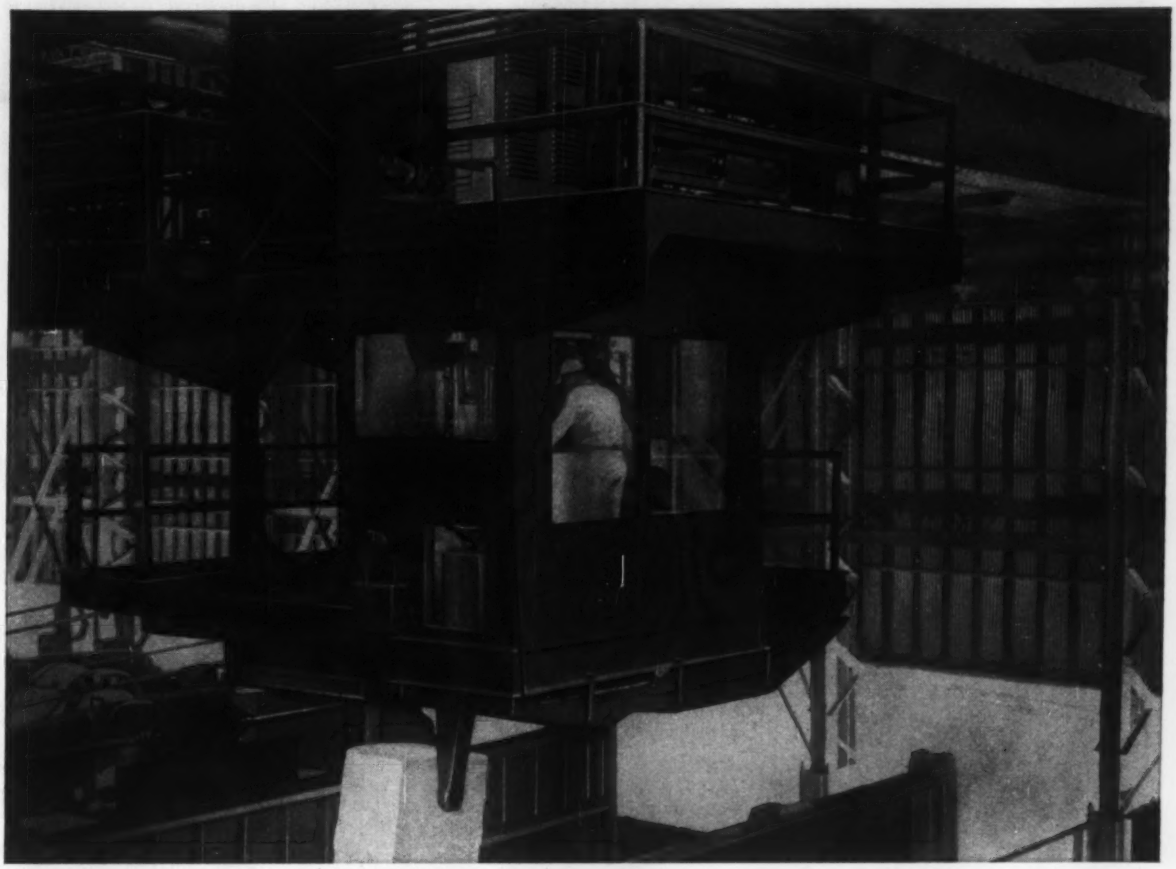
†F.o.b., shipping point.



PULLING DOWN TEMPERATURES PUSHES UP PRODUCTIVITY

Keeping crane operators cool and comfortable when working over steel mill "hot spots" is a well-tested method of increasing their efficiency. That is why Lone Star Steel Company installed seven Dravo Crane Cab Conditioners on their soaking pit and open hearth cranes.

This equipment protects the operators from excessive heat by maintaining 78 to 80° F when temperatures outside the cab become extremely high. It also removes dust, dirt and fumes which, combined with intense heat, impair efficiency, decrease alertness and make frequent relief periods necessary.

With Dravo Crane Cab Conditioners, the operators work in a comfortable atmosphere which promotes safe and continuous operation. This in turn helps to increase production.

This is just one of the many ways that Dravo has been serving business and industry in a variety of engineering activities for more than 60 years. Dravo considers customer satisfaction an essential factor in all its products and services. DRAVO CORPORATION, PITTSBURGH 25, PENNA.

THIS *too* IS DRAVO

Blast furnace turbo-blowers • boiler and power plants • bridge sub-structures • crane cab conditioners

docks • dredging • fabricated piping and erection • gantry and floating cranes • gas and oil pumping stations • industrial foundations • locks and dams

process equipment • ore and coal bridges • ore agglomeration equipment • pumphouses and intakes • ready-mixed concrete • river sand and gravel •

shipping containers • slopes and shafts • space heaters • grating and treads • towboats, barges • river transportation • tunnels • unloaders

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MONEL • NICKEL • COPPER • ALLOYS
THIN STRIP

for exacting standards only

Not one strip rolling requirement in ten need be carefully "miked" to assure close width tolerance.

But that exceptional job is routine with Somers THIN STRIP. Monel, pure Nickel and Nickel alloys are rolled to within ±5% from .010″ to .00075″, with the same degree of accuracy in widths, and with the exact properties required by your product.

Modern rolling, annealing and precision control equipment assure uniform high quality under the most rigid specifications.

And Somers 40 years experience in a wide range of applications is available to help solve your strip problem without obligation.

Write for confidential data blank or field engineer.

FOR EXACTING STANDARDS ONLY
Somers

Somers Brass Company, Inc.
WATERBURY, CONN.

(Concluded from page 151)

declined for the fifth consecutive month, totaling 1,974,000 tons, 2 per cent less than at the end of January.

St. Louis—The scrap market continues strong and slightly bullish. Railroad material has moved higher in most categories, prices being up from 50 cents to $2 a ton. Brokers' prices generally are firm. No drop is expected in the immediate future. Some scrap continues to move out of the area, including rerolling rails, angles and bars, stove plate, No. 1 bundles and No. 1 busheling.

Birmingham — An Atlanta steel mill re-entered the market last week for limited quantities of open-hearth scrap, paying $40 for No. 2, delivered. This, however, did not cause any change in prices at Birmingham. An Alabama mill that has been holding up shipments last week accepted limited tonnage.

Los Angeles—The scrap market here continues soft. For most dealers, however, first quarter business was as good as that in the like period of 1955, despite the most erratic price shifts in recent years.

Seattle—With district yards well stocked, larger scrap buyers are out of the market. One mill is offering $30 for melting grades, but that price is entirely out of line with the current quotations for No. 1 and No. 2, $39 and $35, respectively. While local consumers are inactive, export interests are purchasing in volume for the Orient.

Ferroalloy Prices

FERROALLOY quotations remain unchanged. The current price schedule was published in full on page 180 of the Apr. 9 issue of STEEL.

Warehouse . . .

Warehouse Prices, Page 139

Except for plates and shapes, warehouses can accommodate customers' needs without difficulty. Inventories of plates and shapes are low, and incoming receipts are distributed immediately. On the West Coast, distributors have requested district mills to divert more tonnage to plate production.

Pressure for cold-rolled sheets isn't quite so heavy as it was earlier. There are indications some current buying is for inventory. Bar demand remains active. The over-all inquiry rate in March was 5 per cent ahead of February's; in April, it is running ahead of March's.

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thin strip brass for deep drawing

Uniform fine grain size of Somers eyelet brass—less than .010 mm. (75X).

with
Fine Grain Finish

Somers Brass Company is pleased to announce the availability of a new, unique annealing process which makes possible a uniform fine grain of less than .010 mm. which can be drawn to full 40% elongation.

Developed in cooperation with the Selas Corp. of America this new process makes it possible to deep draw Somers THIN STRIP and still obtain a fine grain which is easily buffed to a brilliant finish.

And this new Selas Furnace provides high production as well as close control of temper and uniformity. It is typical of the modern equipment with which Somers produces copper, brass and other alloys to rigid specifications between .010″ and .00075″.

If you have a problem with thin strip, let Somers experience help you. Write for confidential data blank or field engineer.

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MONEL • NICKEL • COPPER • ALLOYS
THIN STRIP

Somers Brass Company, Inc.
WATERBURY, CONN.

STRUCTURAL SHAPES . . .

STRUCTURAL STEEL PLACED

3235 tons, multiple span composite girder and beam bridge, multiple span composite rolled beam viaduct and grade separation, Connecticut turnpike project 316A-01, West Haven-New Haven, to Phoenix Bridge Co., Phoenixville, Pa.; Mariani Construction Co. Inc., New Haven, Conn., general contractor.

1600 tons, power plant extension, unit 2, Tampa Electric Co., Tampa, Fla., to Orleans Materials & Equipment Co., New Orleans; Stone & Webster Engineering Corp., Boston, engineer-contractor.

540 tons, four state bridges, contract 4, Northeast expressway, Revere, Mass.; to Groisser & Shlager Iron Works, Somerville, Mass.; M. DeMatteo Construction Co., Quincy, Mass., general contractor.

475 tons, junior high school, Lower Merion Township, Pennsylvania, to Bethlehem Steel Co., Bethlehem, Pa.

450 tons, shop and craneway addition, Todd Shipyard Corp., Seattle, to Isaacson Iron Works, Seattle; general contractor is General Construction Co., Seattle; two cranes to Ederer Engineering Co., Seattle.

350 tons, structurals and bars, Conrad high school, West Hartford, Conn., to City Iron Works, Inc., Hartford (structurals) and Scherer Steel Co., East Hartford (bars); Wadhams & May Co., Hartford, general contractor.

300 tons, structurals and bars, office-factory, Smyth Mfg. Co., Hartford, Conn., to Standard Structural Steel Co., Hartford (structurals) and Scherer Steel Co., Hartford, (bars); Bartlett-Barinard Co., West Hartford, general contractor.

275 tons, state highway bridge, Southeast expressway, Quincy-Braintree, Mass., to Phoenix Bridge Co., Phoenixville, Pa.; Charles Capone Co., Boston, general contractor.

265 tons, store addition, Tacoma, Wash., to Isaacson Iron Works, Seattle.

200 tons, state highway bridge, Coventry-West Warwick, R. I., to Tower Iron Works, Providence, R. I.; Campanella & Cardi Construction Co., Hillsgrove, R. I., general contractor; reinforcing bars to U. S. Steel Supply Division, U. S. Steel Corp., Cambridge, Mass.

130 tons, Oregon state highway underpass, Tillamook county, to Bethlehem Pacific Coast Steel Corp., Seattle.

100 tons, state highway bridge, Hooksett, N. H., to Phoenix Bridge Co., Phoenixville, Pa.; Frank Palazzi Co., Johnston, R. I., general contractor.

100 tons, Washington state school project, to Leckenby Structural Steel Co., Seattle.

100 tons, Alaska railroad shops, Anchorage, Alaska, to Leckenby Structural Steel Co., Seattle; Warrack Construction Co., general contractor.

Unstated, Montana state 825-ft Rosebud county bridge, to unstated interest.

STRUCTURAL STEEL PENDING

5000 tons, Jewish Medical Center, Baltimore (noted in previous issue as pending); Turner Construction Co., general contractor.

4000 tons, addition to University of Washington teaching hospital, Seattle; bids May 3; previously reported for Apr. 20.

1550 tons, high school, Allentown, Pa., Gottlieb Schneider, Bethlehem, Pa., awarded general contract.

1000 tons, senior high school, Lower Merion Township, Pennsylvania; bids Apr. 25.

570 tons, beam bridge and two overpasses, Bow-Concord, N. H.; Peter Salvucci & Sons, Waltham, Mass., low, general contract; also 310 tons, reinforcing bars, and 315 tons, steel piles.

304 tons, state bridge work, Philadelphia county, Pennsylvania, bids Apr. 20; also 135 tons of reinforcing bars. As an alternate, approximately 100 tons of reinforcing bars, plus precast prestressed concrete beams.

300 tons, state beam bridges, Pennsylvania boulevard, Philadelphia; bids Apr. 20, with reinforced concrete steel specifications added to original plans as an alternate.

275 tons, three state bridges, Andover, N. H.; also 80 tons, reinforcing bars; 35 tons, piling.

265 tons, including piling and reinforcing, 3-span rolled beam state bridge, Madison, Conn.; bids Apr. 16.

120 tons, 3-span rolled beam bridge extension, Manchester, Conn.; bids Apr. 16.

REINFORCING BARS . . .

REINFORCING BARS PLACED

1555 tons, bridges, retaining wall and drainage structures, Connecticut turnpike project 317-04, New Haven, Conn., to Bethlehem Steel Co., Bethlehem, Pa.; C. W. Blakeslee & Sons, Inc., New Haven, general contractor; 1035 tons, steel piles, to Bethlehem Steel Co., Bethlehem, Pa.

1150 tons, five grade separations, and foundations, three viaduct structures, Connecticut turnpike project 310-01, Fairfield-Bridgeport, to Bethlehem Steel Co., Bethlehem, Pa.; Cayuga Foundation Corp., New York, general contractor; 4575 tons, steel piles, to Bethlehem Steel Co.

1025 tons, also 385 tons, mat reinforcing, 11 grade separations and drainage structures, Connecticut turnpike project 309-02, Fairfield, to Fireproof Products Co., Inc., New York. J. Orlando Contracting Co., New York, general contractor; 575 tons, steel piles, to Bethlehem Steel Co., Bethlehem, Pa.

825 tons, bridge, viaduct and grade separation, Connecticut turnpike project 316A-01, West Haven-New Haven, to Bethlehem Steel Co., Bethlehem, Pa.; Mariani Construction Co., Inc., New Haven, general contractor; 2565 tons, H-piles, to Bethlehem Steel Co., Bethlehem, Pa.

270 tons, addition to telephone accounting building, Seattle, to Bethlehem Pacific Coast

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WANTED

ELECTRIC STEEL MELTING FURNACE

TILTING TYPE, 12' DIAMETER SHELL, TOP CHARGE, SWINGING ROOF TYPE, WITH OR WITHOUT TRANSFORMER AND ELECTRIC CONTROLS. MUST BE IN GOOD CONDITION.

Contact:

Mr. J. A. Bright, Chief Engineer
Pittsburgh Metallurgical Company, Inc.
3801 Highland Avenue
Niagara Falls, New York

FOR SALE

1200 H.P. Motor, Mfg.: General Electric Co., Type MT-30—Form A, 2300 V., 3 Phase, 60 Cy., 237 R.P.M., Wound Rotor Induction, 305 Amp. Primary, 830 Amp. Secondary.

Write Box 398, STEEL
Penton Bldg. **Cleveland 13, Ohio**

CLASSIFIED

Help Wanted

MECHANICAL ENGINEER—Recent M.E. graduate desired for employment as project engineer in long established valve manufacturing firm. Permanent position. Excellent opportunity for advancement. Salary commensurate with ability. Located in progressive North Central Penna. community. Experience in Pressure vessels and piping desirable but not necessary. Submit qualifications to Box 403, STEEL, Penton Bldg., Cleveland 13, Ohio.

DESIGNER FOR FORMING ROLLS used in producing hollow metal sections on cold metal roll forming machines. Capable of handling roll design and supervising production and testing of rolls. Old established company; submit complete qualifications and salary desired. Box No. 407, STEEL, Penton Bldg., Cleveland 13, Ohio.

Accounts Wanted

STEEL ERECTOR with design and detailing facilities wishes to represent structural steel fabricator in metropolitan N. J. Write Box 408, STEEL, Penton Bldg., Cleveland 13, Ohio.

WANTED

BY REPUTABLE MANUFACTURER

A man experienced in the manufacture of Machine Screws—Must be expert Header Mechanic and assume complete charge. Can purchase stock in company. Please supply full information and expected remuneration.

Reply Box 409, STEEL
Penton Bldg. **Cleveland 13, Ohio**

FORGING ENGINEER

Immediate opening for Top Caliber Forging Engineer with Proven Ability and Experience in Drop Forging, Steam Hammers, Board Hammers, Upsetters and Forging Presses.

Salary Commensurate with Ability & Experience.

Send Complete Resume.

Reply Box 405, STEEL
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Immediate opening for Top Caliber Forge Shop Chief Inspector with Proven Ability and Experience in Drop Forging Quality Inspection.

Salary Commensurate with ability and experience.

Send Complete Resume.

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WANTED BY LARGE REPUTABLE MANUFACTURER

A man experienced in the manufacture of seamless welding fittings to assume complete charge of this departmental activity to develop and expand it. In replying, please supply full information on experience and expected remuneration.

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Most modern and progressive steel foundry in the middle west. Advise full particulars.

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WE CAN HELP YOU TO CONTACT high calibre men to fill specific jobs you have in mind—
Readers of STEEL include men of wide training and experience in the various branches of the metalworking industry.
When you have an opportunity to offer, use the Help Wanted columns of STEEL.

SILENT HOIST
KRANE KAR

"DOES JOB FASTER, SAVES US ONE MAN,"
says Jim Gull, Supt. Equip't.,
Gull Contracting Co.,
New Lincoln Tunnel
Job, New York

Another
SILENT HOIST "First"
—FLUID DRIVE!

"We had a 20-ton crane on the job; now the KRANE KAR* does it faster and saves us one man. Works all over site as utility crane, 8 hrs. a day, 5 or 6 days a week. Handles beams, buckets, concrete and steel forms, lumber, cement, etc. Stores incoming materials and delivers them where needed. Loads, unloads trucks, and carries big loads up and down ramp. KRANE KAR is easy to operate; we have a half dozen men here who can run it. Doing a fine job for us," says Mr. Gull.

Write for illustrated Bulletin No. 79

****KRANE KAR Swing-Boom Mobile Crane available gas or diesel; adjustable telescopic boom; rubber tired; 5 sizes: 1½, 2½, 5, 10, 12½ ton cap.***

SILENT HOIST & CRANE CO.
Pioneer Mfrs. of Heavy Duty Materials-Handling Equipment
849 63rd Street, Brooklyn 20, N. Y.

★ PUNCHES ★ DIES ★ RIVET SETS ★ COMPRESSION RIVETER DIES ★

52 Years making quality punches and dies. Our many customers throughout the nation repeat year after year because they know they can rely on our tools for consistent performance.
Write Dept. A for New Catalog 54

GEO. F. MARCHANT COMPANY
1420-34 So. ROCKWELL STREET · CHICAGO 8, ILLINOIS

Steel Corp., Seattle; John H. Sellen Construction Co., Seattle, general contractor.

210 tons, igloos, warehouse, etc., Glasgow (Mont.) Air Base, to Bethlehem Pacific Coast Steel Corp., Seattle; general contract to Sound Construction & Engineering Co., Seattle, low at $3,027,840.

175 tons, wing addition, Sturdy Memorial Hospital, Attleboro, Mass., to Plantations Steel Co., Providence, R. I.; Towley Construction Co., Pawtucket, R. I., general contractor; structurals to Groisser & Shlager Iron Works, Somerville, Mass.

150 tons, military construction, Elmendorf Air Base, Alaska, to Bethlehem Pacific Coast Steel Corp., Seattle; M. B. Contracting Co. Inc., Seattle, general contractor.

100 tons or more, research building, Brown & Williamson Tobacco Co., Louisville, to American Builders Supply Co., Louisville; Struck Construction Co., Louisville, general contractor.

92 tons, Washington state underpass, Jefferson county, to Bethlehem Pacific Coast Steel Corp., Seattle; T. T. Burnham, general contractor.

70 tons, housing project, Adak, Alaska, to Soule Steel Co., Seattle.

REINFORCING BARS PENDING

670 tons, guided missile installations, eastern Washington; general contract to Campbell Construction & Equipment Co., San Francisco, low at $3,644,408 to U. S. Engineer, Walla Walla, Wash.

500 tons, warehouse, Campbell Soup Co., Camden, N. J., Turner Construction Co. awarded general contract.

376 tons, state bridge work, Berks county, Pa.; James Julian, Bellsmere, Del., low on general contract.

135 tons, state bridge work, Philadelphia county, Pennsylvania, bids Apr. 20; also 304 tons of structural steel. An alternate involves approximately 100 tons of reinforcing bars, plus precast prestressed concrete beams.

100 tons or more, Washington state bridge approaches, Grays Harbor county; general contract to Osberg Construction Co., Seattle, at $489,803.

Unstated, Oregon state underpass, Hermiston; general contract to George E. Barry, Beaverton, Oreg., low at $101,500.

PLATES . . .

PLATES PLACED

150 tons, penstock installation, Snoqualmie Falls, Wash., plant to Hydraulic Supply Mfg. Co., Seattle, for Puget Sound Power & Light Co.

PLATES PENDING

180 tons, low alloy, Topeka Air Force Base, Kans.

Unstated, two 1700-ft penstocks, B. C. Electric Co., power project, Cheakamus river, British Columbia; Mannix Ltd., Vancouver, B. C., general contractor.

PIPE . . .

CAST IRON PIPE PLACED

90 tons, system expansion, Tumwater, Wash., to U. S. Pipe & Foundry Co., Seattle.

CAST IRON PIPE PENDING

750 tons, various sizes, also alternatives; bids to Montesano, Wash., Apr. 10.

RAILS, CARS . . .

LOCOMOTIVES PLACED

Canadian Pacific, 20 diesel locomotives to Canadian Locomotive Co. Ltd., Montreal, Canada.

RAILROAD CARS PLACED

Chesapeake & Ohio, 500 fifty-ton boxcars to Pullman-Standard Car Mfg. Co., Chicago. The cars were originally ordered by the New York, New Haven & Hartford, which subsequently asked to be relieved of the commitment. Deliveries will start immediately.

RAILROAD CARS PENDING

Atchison, Topeka & Santa Fe, to modernize 1000 freight cars. Work includes new steel flooring in gondola cars.

Louisville & Nashville, 2000 coal hopper cars and 100 covered hoppers, pending.

Advertising Index

Abell-Howe Co. 150
Air Products, Inc. 34
Ajax Flexible Coupling Co., Inc. 86
Alliance Machine Co., The 99
Allis-Chalmers 41
Allis, Louis, Co., The 147
American Brass Co., The 129
American Cast Iron Pipe Co., Special Products Division 26
American Chain & Cable 60
American Machine & Foundry Co., Cleveland Welding Division 131
American Smelting & Refining Co., Continuous Cast Products Department 140
Arcos Corporation 116, 117
Armco Steel Corporation 48
Associated Spring Corporation 13
Avey Drilling Machine Co., The 14, 15

Baldwin-Lima-Hamilton Corporation, Hamilton Division 119
Baltimore & Ohio Railroad 62
Barnes-Gibson-Raymond, Division of Associated Spring Corporation 13
Barnes, Wallace, Co., Division of Associated Spring Corporation 13
Barnes, Wallace, Co., Ltd., The, Division of Associated Spring Corporation 13
Bay State Abrasive Products Co. 90
Bethlehem Steel Co. 1, 158
B-G-R Cook Plant, Division of Associated Spring Corporation 13
Bullard Co., The 64

Carborundum Co., The 16, 142, 151
Carpenter Steel Co., The 11
Cattie, Joseph P., & Brothers, Inc. 150
Century Electric Co. 121
Chambersburg Engineering Co. 28
Cincinnati Gear Co., The 5
Cincinnati Shaper Co., The 27
Cleveland Cap Screw Co., The 143
Cleveland-Cliffs Iron Co., The 20
Cleveland Metal Abrasive Co., The 77
Cleveland Welding Division, American Machine & Foundry Co. 131
Cleveland Worm & Gear Co., The Inside Back Cover
Cold Metal Products Co., The 47
Colorado Fuel & Iron Corporation, The 17, 104, 105
Columbia-Geneva Steel Division, United States Steel Corporation 80, 81
Continuous Cast Products Department, American Smelting & Refining Co. 140
Copperweld Steel Co., Steel Division 67
Cutler-Hammer, Inc. Back Cover

Danly Machine Specialties, Inc. 108, 109
DeVilbiss Co., The 78, 79
Dravo Corporation 153
Dresser Industries, Inc., Dresser Manufacturing Division 150
Dunbar Brothers Co., Division of Associated Spring Corporation 13
Dykem Co., The 148

Eastern Machine Screw Corporation, The 150
Electric Controller & Mfg. Co., The Inside Front Cover
Erie Bolt & Nut Co. 145

Fate-Root-Heath Co., The, Plymouth Locomotive Works Division 43
Fenn Manufacturing Co., The 10
Firth Sterling, Inc. 102
Frasse, Peter A., & Co., Inc. 3

Gardner Machine Co. 21
General Motors Corporation, Saginaw Steering Gear Division 85
General Refractories Co. 19
Gibson, William D., Co., The, Division of Associated Spring Corporation 13
Goodyear Tire & Rubber Co., Inc., The 4
Greenlee Bros. & Co. 9

Hamilton Division, Baldwin-Lima-Hamilton Corporation 119
Hyde Park Foundry & Machine Co. 157

Ingersoll-Rand 110
Island Creek Coal Sales Co. 125

Joliet Wrought Washer Co. 133

Kaiser Aluminum & Chemical Sales, Inc. 29, 30, 31, 32

Lodge & Shipley Co., The 18
Lord Baltimore Hotel, The 151

McKay Machine Co., The 59
McKinney Manufacturing Co. 148

Mahon, R. C., Co., The 40
Malleable Founders' Society 84
Manning, Maxwell & Moore, Inc. 12
Manross, F. N., & Sons Co., Division of Associated Spring Corporation 13
Marchant, Geo. F., Co. 156
Micro Switch, A Division of Minneapolis-Honeywell Regulator Co. 107
Milwaukee Division of Associated Spring Corporation 13
Milwaukee Foundry Equipment Division, SPO, Inc. 126
Minneapolis-Honeywell Regulator Co., Micro Switch Division 107
Morgan Engineering Co., The 38

National Automatic Tool Co., Inc. 88, 89
National Steel Corporation 39
National Tube Division, United States Steel Corporation 80, 81
Norton Co. 22, 23

Oakite Products, Inc. 120
Ohio Division of Associated Spring Corporation 13

Peters-Dalton, Inc. 75
Pittsburgh Metallurgical Co., Inc. 155
Plymouth Locomotive Works Division of The Fate-Root-Heath Co. 43

Raymond Manufacturing Co., Division of Associated Spring Corporation 13
Republic Steel Corporation 36, 37
Roebling's, John A., Sons Corporation, A Subsidiary of The Colorado Fuel & Iron Corporation 17
Rollway Bearing Co., Inc. 83
Roto-Finish Co. 118
Ryerson, Joseph T., & Son, Inc. 50

Saginaw Steering Gear Division, General Motors Corporation 85
Sandvik Steel, Inc. 87
Seaboard Coil Spring Division of Associated Spring Corporation 13
Silent Hoist & Crane Co. 156
Simonds Abrasive Co. 33
SKF Industries, Inc. 2
Somers Brass Co., Inc. 154
SPO, Inc., Milwaukee Foundry Equipment Division 126
Standard Pressed Steel Co., Unbrako Socket Screw Division 42
Standard Tube Co., The 82
Sterling Bolt Co. 25
Swedish Crucible Steel Co. 155

Teiner, Roland, Co., Inc. 71
Texas Co., The 44
Thilmany Pulp & Paper Co. 114
Timken Roller Bearing Co., The, Steel & Tube Division 68
Tinnerman Products, Inc. 72
Torrington Co., The 149

Union Wire Rope Corporation 7
United States Graphite Co., The, Division of The Wickes Corporation 101
United States Steel Corporation, Subsidiaries 24, 80, 81
United States Steel Export Co. 80, 81
United States Steel Supply Division, United States Steel Corporation 24

Weirton Steel Co. 39
Wendt-Sonis Co. 122, 123
Wickes Corporation, The, The United States Graphite Co. Division 101
Wickwire Spencer Steel Division of The Colorado Fuel & Iron Corporation 104, 105
Wisconsin Motor Corporation 142

Yoder Co., The 35
Youngstown Sheet & Tube Co., The 8

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Table of Contents, Page 5

Classified Advertising, Page 155

Red Circle Rolls for all Purposes

The Red Circle on the Roll is the Hyde Park mark of Quality. Hyde Park makes rolls for every type mill.

Chilled Rolls
Alloy Iron Rolls
Moly Rolls
Nickel Chilled Rolls
Grain Rolls
Cold Rolls
Sand Rolls

for
Finer Finish, Longer Life
and Greater Tonnage
specify Red Circle

Hyde Park
FOUNDRY & MACHINE CO.
Hyde Park, Westmoreland County, Pa.
ROLLS • ROLLING MILL MACHINERY
GREY IRON CASTINGS

RED CIRCLE
Rolls
ALLOY-CHILLED

XV

This is the fifteenth of a series of advertisements dealing with basic facts about alloy steels. Though much of the information is elementary, we believe it will be of interest to many in this field, including men of broad experience who may find it useful to review fundamentals from time to time.

Boron and Its Effects in Alloy Steels

Boron is a nonmetallic element of which this country has a plentiful supply. In its natural or unprocessed state it occurs only in combination, as in borax, etc. Pure boron is a gray, extremely hard solid with a melting point in excess of 4000 deg F.

This element is used in steel for one purpose only—to increase hardenability; that is, to increase the depth to which the steel will harden when quenched. Its effective use is limited to sections whose size and shape permit of liquid quenching. Only a few thousandths of 1 pct is ordinarily added, and boron steels are evaluated by increased hardenability rather than chemical content. A number of alloys, including several grades of ferroboron, are available for adding boron to steel.

Boron intensifies the hardenability characteristics of other elements present in the steel. It makes possible a considerable degree of alloy conservation when used with steels containing small amounts of alloying elements. However, since it readily oxidizes at high temperatures, some steelmakers prefer a melt with relatively low boron content and relatively high contents of other elements that protect the boron from oxidation.

It should be noted that boron is very effective when used with low-carbon alloy steels; but its effect is reduced as the carbon increases. When the carbon content is above 0.60 pct, the use of boron is not suggested, the exception being the "case" in those steels that are carburized.

Boron steels often require closer temperature control in heat-treatment than do some of the other alloy analyses; but aside from this they present no special problems. Their cold- and hot-working properties are considered at least equal to those of ordinary alloy steels. In cases where boron makes possible a lower alloy content, improved machinability frequently results.

If you would like to know more about boron and its effects in alloy steels, you are invited to consult with Bethlehem's metallurgical staff. Our technicians will gladly give you all the information you need, and will work closely with you in every respect. And when it is time to replenish supplies of steel, remember that Bethlehem manufactures the full range of AISI standard alloy grades, as well as special-analysis steels and all carbon grades.

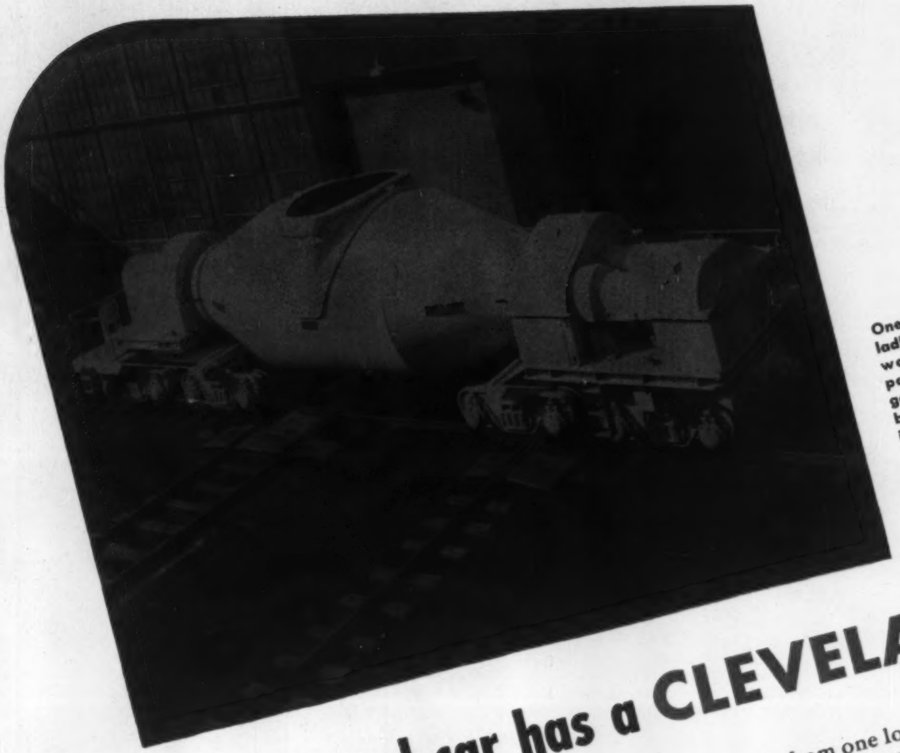
If you would like a reprint of this advertisement, or of the entire series from I through XV, please write to us, addressing your request to Publications Dept., Bethlehem Steel Company, Bethlehem, Pa.

BETHLEHEM STEEL COMPANY
BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

BETHLEHEM STEEL



One of the world's largest ladle cars, built for one of the world's largest steel companies. Cleveland worm gearing in this car is backed by 44 years of specializing in the manufacture of worms and gears.

200-ton hot metal car has a CLEVELAND drive

CONVEYING 200 tons of molten iron from one location to another is a critical job. Precision engineered equipment is a must. Steady, never faltering control is required always—to turn the ladle left, right, completely over, back to center.

To provide the exactness and accuracy of control required, the William B. Pollock Company, the builder of this 200-ton ladle car, employed Cleveland worm gearing. Even though gear life will be one of continued stresses, it will operate dependably through the years because Cleveland worm gearing maintains its efficiency. Cleveland worms and gears actually improve in service. The tooth contour remains unchanged throughout the life of the gearing. This means that your Cleveland worm gearing will be as efficient ten, twenty or thirty years from today as it is when new.

Get full engineering data by writing for free Catalog 400. The Cleveland Worm and Gear Company, 3270 East 80th Street, Cleveland 4, Ohio.

Affiliate: The Farval Corporation, Centralized Systems of Lubrication. In Canada: Peacock Brothers Limited.

CLEVELAND
Worm Gear
Drives

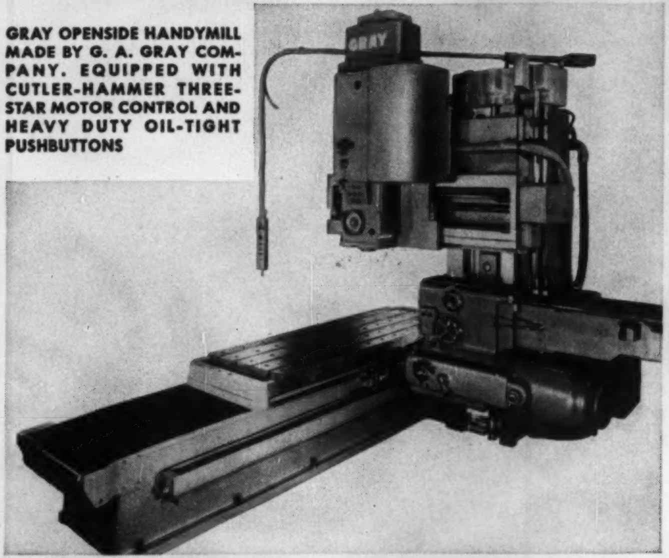
Choice of the Leaders

CUTLER-HAMMER

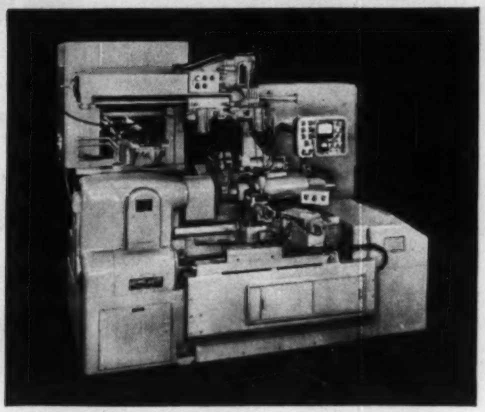
MOTOR CONTROL

C-H

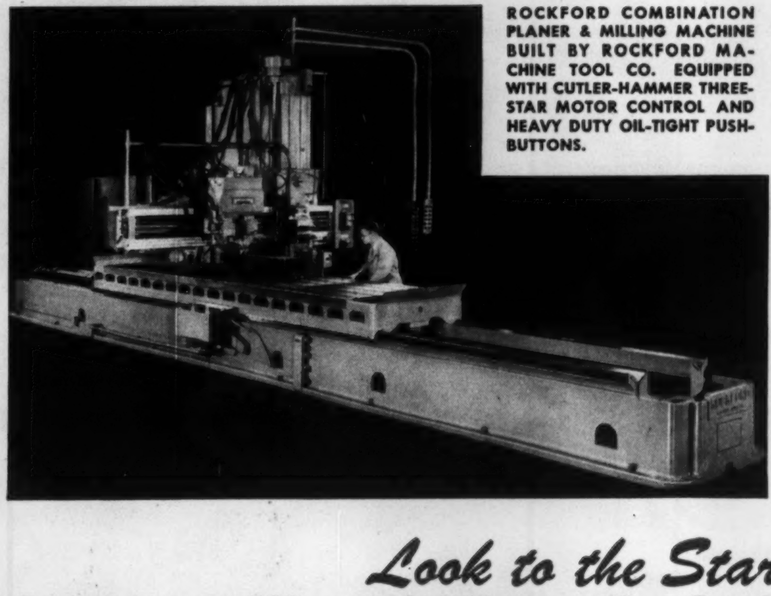
The Mark of Better Machines



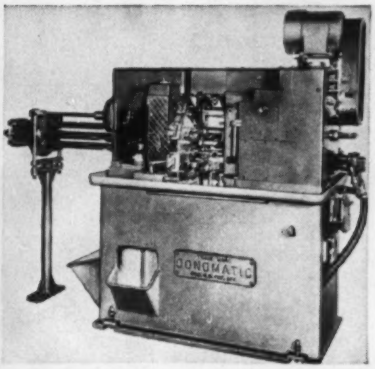
GRAY OPENSIDE HANDYMILL MADE BY G. A. GRAY COMPANY. EQUIPPED WITH CUTLER-HAMMER THREE-STAR MOTOR CONTROL AND HEAVY DUTY OIL-TIGHT PUSHBUTTONS



MONARCH MODEL 21 MONA-MATIC LATHE WITH AUTOMATION BUILT BY THE MONARCH MACHINE TOOL CO. EQUIPPED WITH CUTLER-HAMMER THREE-STAR MOTOR CONTROL.



ROCKFORD COMBINATION PLANER & MILLING MACHINE BUILT BY ROCKFORD MACHINE TOOL CO. EQUIPPED WITH CUTLER-HAMMER THREE-STAR MOTOR CONTROL AND HEAVY DUTY OIL-TIGHT PUSHBUTTONS.



MODEL TK CONOMATIC AUTOMATIC LATHE MADE BY CONE AUTOMATIC MACHINE COMPANY, INC. EQUIPPED WITH CUTLER-HAMMER THREE-STAR MOTOR CONTROL AND HEAVY DUTY OIL-TIGHT PUSHBUTTONS.

Look to the Stars

Persistently accomplishing yesterday's "impossible," leading machinery builders regularly provide their customers with new opportunities, finer precision, increased production, higher efficiency. Basic to such leadership is an unending search for anything *new* that is better . . . new materials, new methods, new components. Progress *must* involve change.

There is much meaning in the broad swing to Cutler-Hammer Three-Star Motor Control and Heavy Duty Oil-Tight Pushbuttons by the leading builders of all types of machines. Such acceptance can come only through careful comparison that proves a definite superiority. Look to the stars for leadership. More than ever, Cutler-Hammer electrical equipment is the mark of better machines. CUTLER-HAMMER, Inc., 1211 St. Paul Avenue, Milwaukee 1, Wisconsin. *Associate:* Canadian Cutler-Hammer, Ltd., Toronto, Ontario.